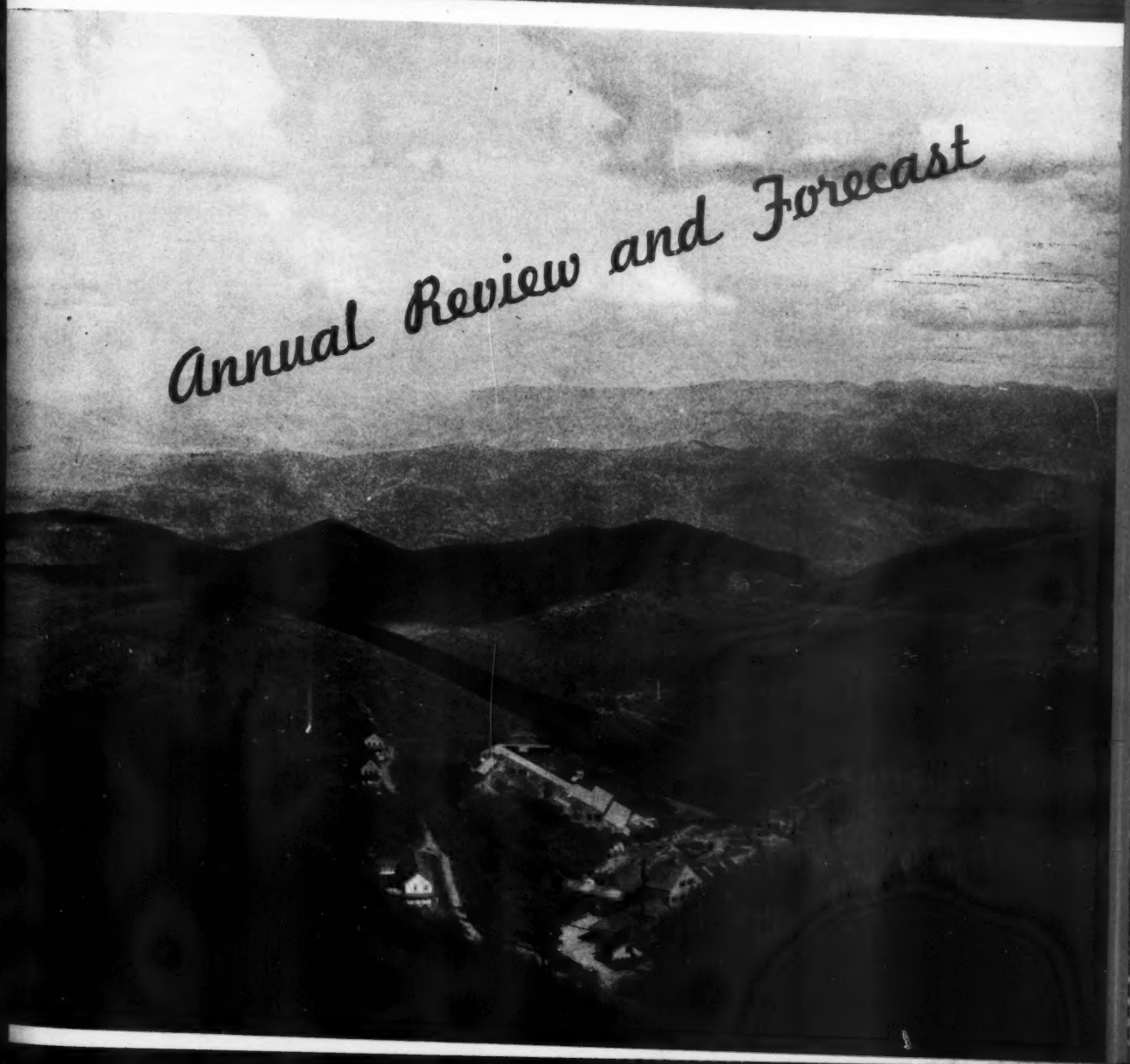
Mining CONGRESS JOURNAL

FEBRUARY 1946



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Yes, that "Stamp of approval", *plus* the advantage of right or left hand control, and the fact *that one motor does the entire power job,* should decide *your* choice when considering the most practical Loader.... We'll be glad to supply more facts if you'll ask for them!

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Mining Congress Journal

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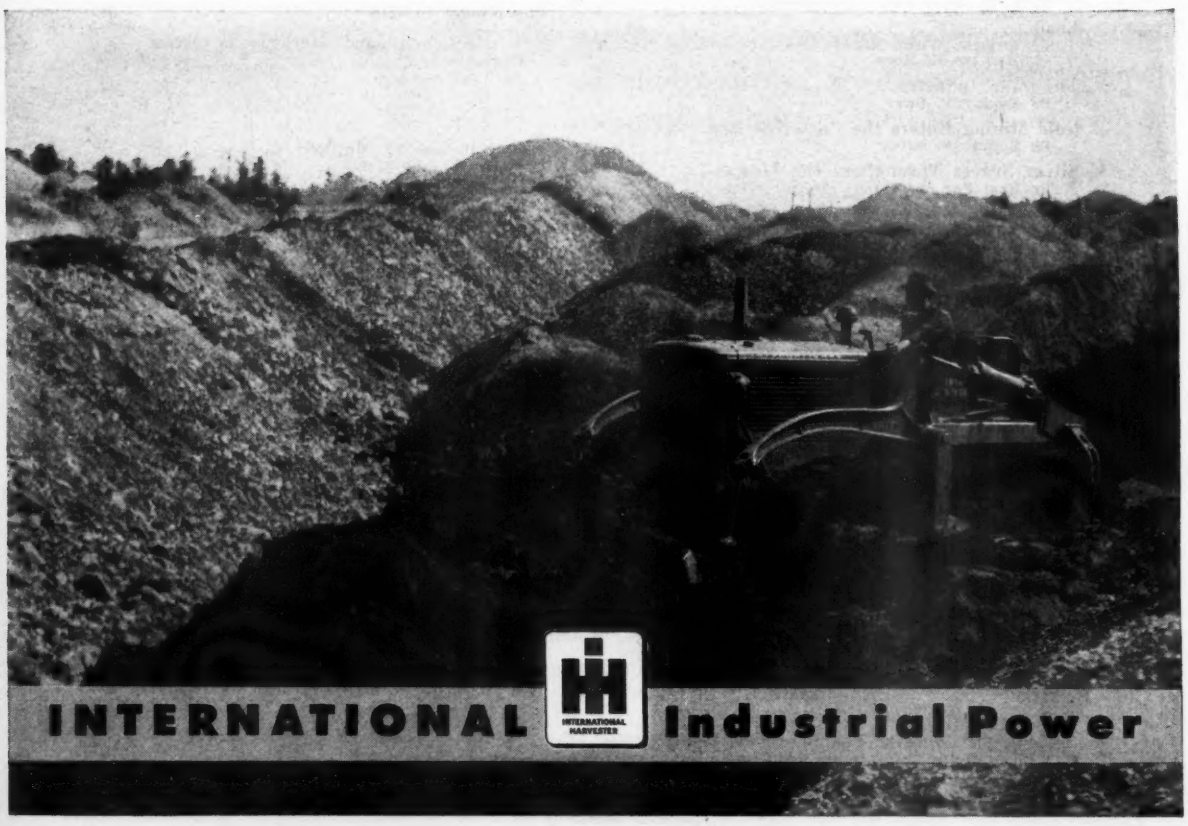

It takes the technical knowledge of all three...the Mining Engineer...the Equipment Engineer and the Belting Engineer...to produce the sure formula for

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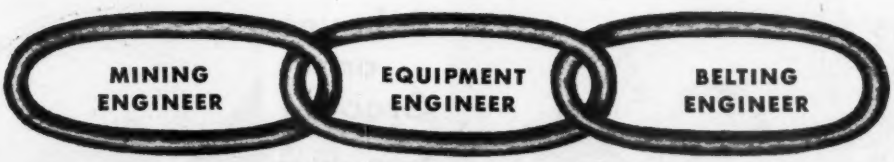

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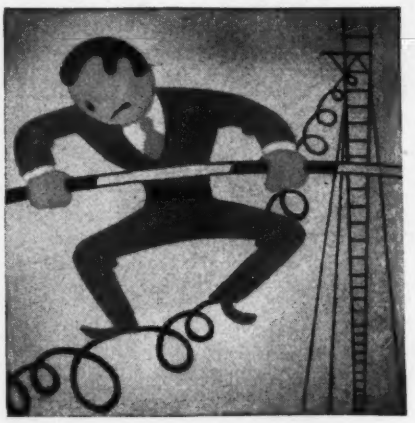

Spools Better

Even with a light load, it spools uniformly—is never cranky.

Takes Reverse Bends

Takes this "fatigue" much better, as on rope-ruining elevator installations.

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Worn union-formed ropes handle as safely as new, as broken outer wires lie close to rope.

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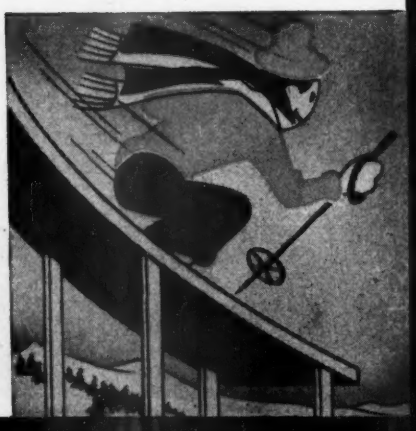

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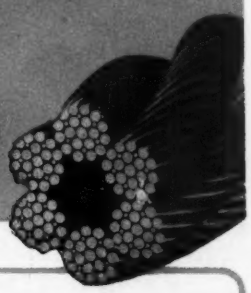

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FIGHT! FIGHT! There is an exhausting fight going on all the time in ordinary wire rope, Each wire is fighting constantly to get out of the fixed position into which it is forced without any preliminary training to put it in shape. This internal fighting spoils the performance, cuts it short, doesn't give you a run for your money.

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Tuffy is the name it pays to remember when buying mining rope. Into Tuffy mining rope construction goes the "know-how" of an organization of specialists whose only business is the making of wire rope.

A specialty within a specialty with Union Wire Rope craftsmen and engineers is the making of mining rope ranging from Tuffy Mining Machine ropes up to 4 in. diameter wire rope for the largest strip mining operations. The giant closing machine that makes the latter is 3 stories high and has a maximum capacity of 27 tons of wire rope in one continuous length.

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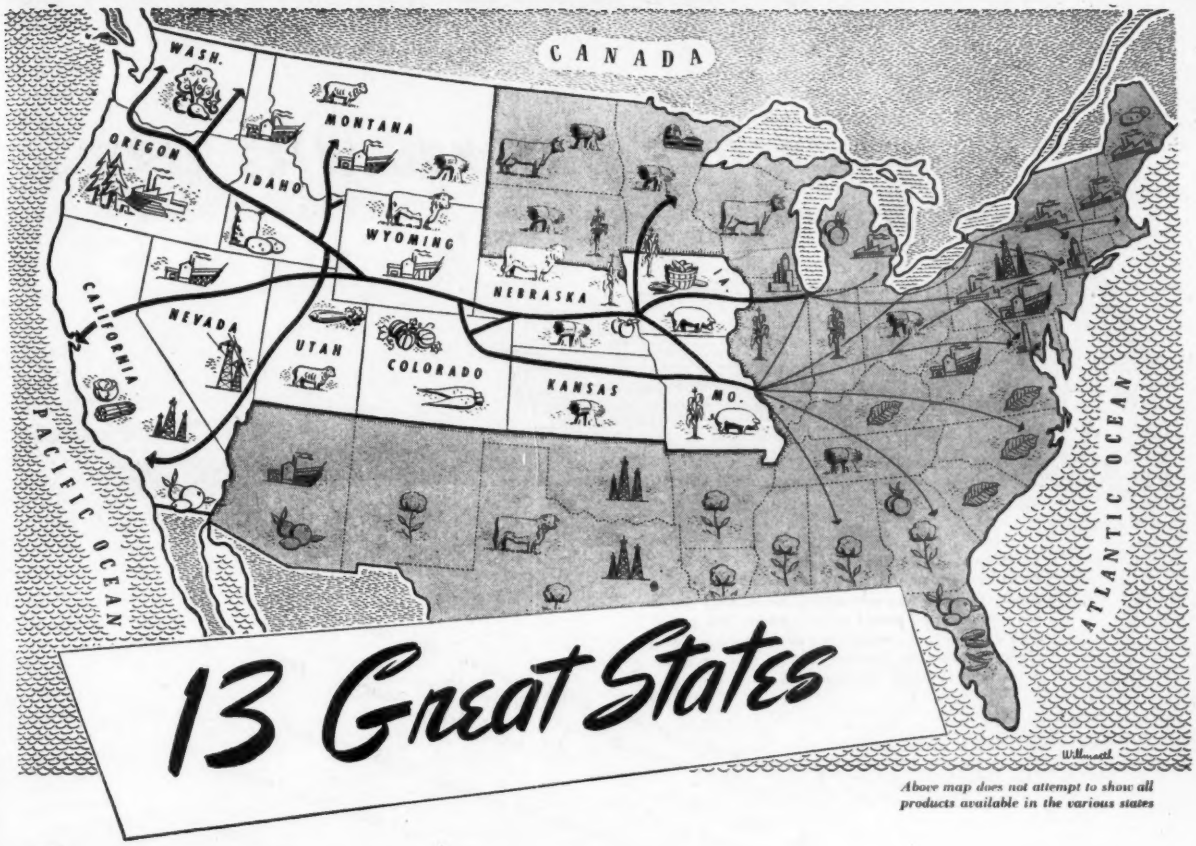


Above map does not attempt to show all products available in the various states

For more than 75 years, Union Pacific has served thirteen western states . . . been a partner in their development.

This vast fertile territory is more than the breadbasket of the nation. Due to its great wealth of industrial raw materials—ore, minerals, petroleum and lumber—it might also be called the nation's treasure-chest. Rivers have been harnessed—providing irrigation and power. And there is splendid rail transportation.

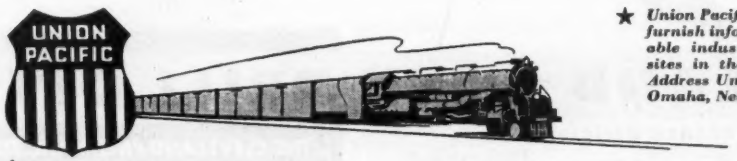
For example, in Montana, Wyoming, Nevada, Utah and other states in Union Pacific territory, there is a large source of supply of steel, iron, copper, and other industrial metals. Union Pacific has the equipment and personnel to meet all the requirements of shippers in those regions.

These thirteen western states served by the railroad are ripe for postwar expansion. They have the materials, facilities and space.

Union Pacific will continue to play its part in the future progress of this western territory by providing unexcelled freight and passenger transportation over its Strategic Middle Route.

Be Specific— say "Union Pacific"

★ *Union Pacific will, upon request, furnish information about available industrial and mercantile sites in the territory it serves. Address Union Pacific Railroad, Omaha, Nebraska.*

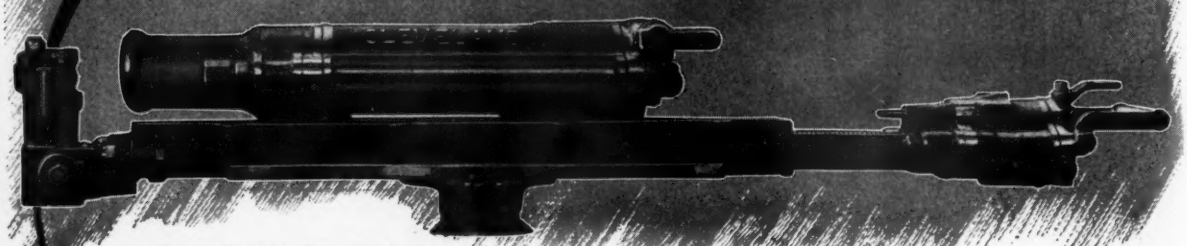


The Progressive

UNION PACIFIC RAILROAD

The Strategic Middle Route

11 REASONS WHY YOU WILL LIKE CLEVELAND DRIFTERS



Cleveland PD14. The Cleveland Power Feed is unaffected by direct shock from the hammer motor. Its controls are in easy reach at all points of feed travel. The power feed automatically moves the drifter forward at a speed suitable for fastest cutting, and its quick return aids in rapid steel changes.

1. The "end-seating" valves improve with use; air consumption never increases with use.
2. Four strong pawls with extra long bearings insure greater pawl life.
3. Honing of cylinders for lasting efficiency and less wear.
4. Grinding of flutes on hammers and rifle bars reduces friction.
5. Oil channels in rifle bar insure proper lubrication of this important part.
6. Heat treating "armor plates" parts against breakage from fatigue or shock.
7. "Clevetrating" prevents rust.
8. Both chuck nut and spacer bushing are easily removed in your own shop.
9. Splined chuck jaw takes 14 different positions in relation to chuck bushing, lengthening the life of the latter.
10. Guide shells have ample feed travel for all standard steel changes, and are of one piece construction.
11. No standard rods to work loose; this means easier cranking and less feed screw wear.

Cleveland Drifters are available in 3", 3½" and 4" sizes, either crank fed or power feed. For complete information send for Bulletin 127.

This Cleveland Centralizer, when furnished, can be attached to any Cleveland Drifter, whether crank or automatic feed type. It directs the steel effectively when collaring the hole, and is easily cleared out of the way, either by hand, or by the nose of the drifter, as the machine is fed forward.

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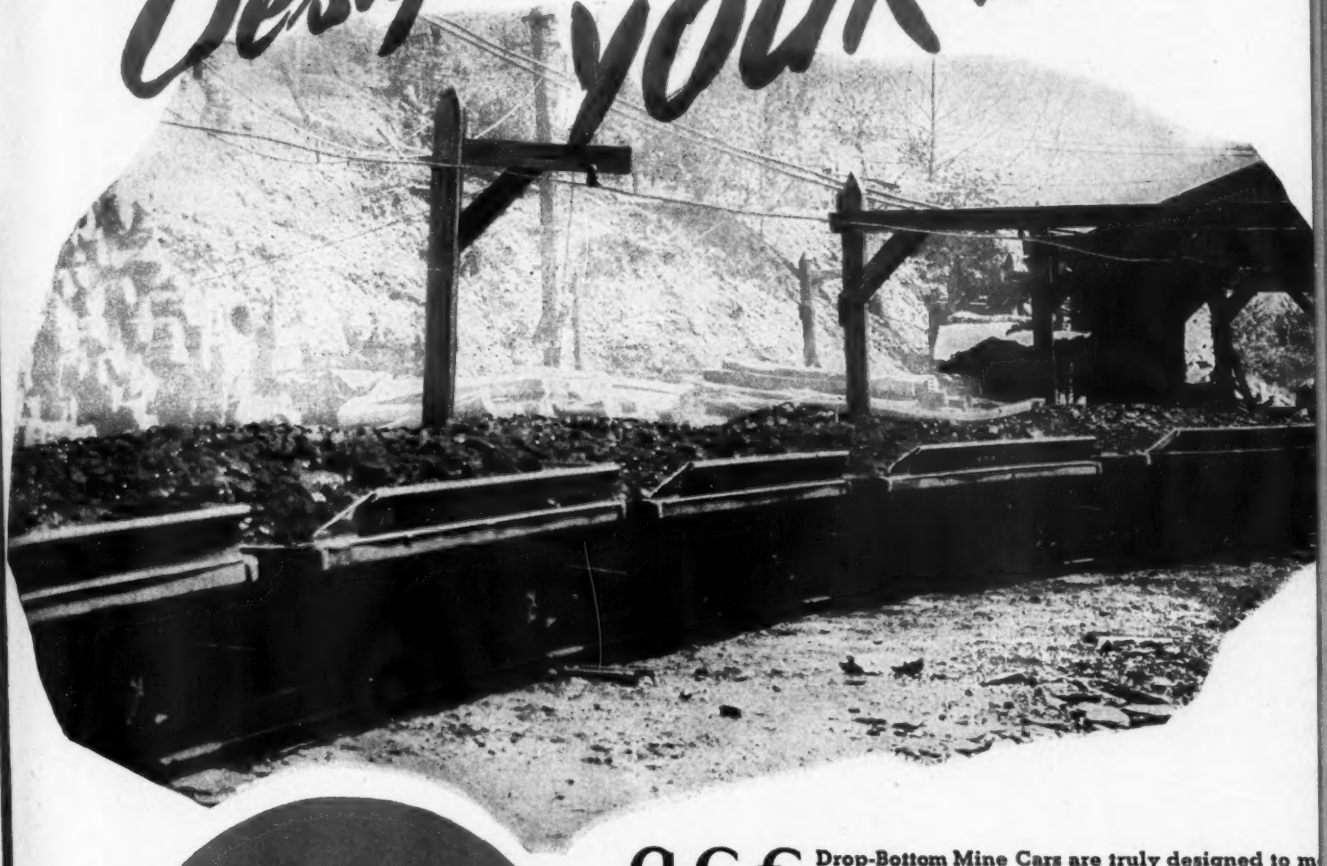

a.c.f. DROP-BOTTOM MINE CARS

a.c.f. Drop-Bottom Mine Cars are truly designed to m the operating conditions of *your* mine. a.c engineers give careful study to *your* service requirements, so t *your* cars are best suited to *your needs!*

a.c.f. Drop-Bottom Cars are fitted with all-welded steel end members, heavy-duty, double-action spring bumpers and "lu cated" doors to insure years of satisfactory service — resulting lower haulage costs and increased production!

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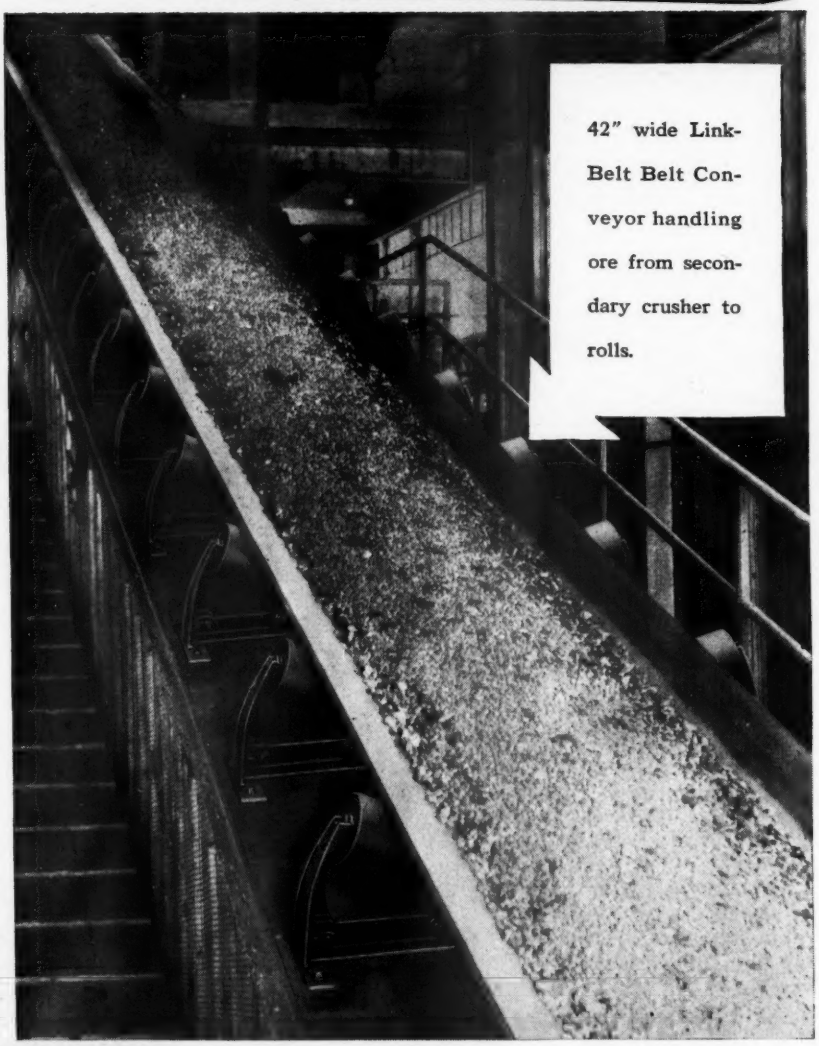
There are good reasons why they perform with minimum power and maintenance—operate smoothly and dependably, and add to the ordinary life of the conveyor belt. Catalog sent on request.



42" wide Link-Belt Belt Conveyor handling ore from secondary crusher to rolls.

Assure longer life to conveyor belts by using Link-Belt Self-Aligning Idlers. They automatically maintain the conveyor belt in a central carrying position without injury to its edges. Made in two types for regular or reversing travel.

LINK-BELT PRODUCTS INCLUDE: Conveyors and Elevators of all types—Belt, Apron, Pan, Bucket, Chain, Bulk-Flo, Sidekar-Karrier, Oscillating-Trough, Flight, Screw, etc. . . . Feeders . . . Vibrating Screens . . . Skip Hoists . . . Car Spotters . . . Silent and Roller Chain Drives . . . Speed Reducers . . . P.I.V. Gear Variable Speed Changers . . . Chains and Attachments of all types . . . Malleable Iron, Promal, and Steel . . . Sprockets . . . Gears . . . Clutches . . . Couplings . . . Base Plates . . . Take-Ups . . . Babbitted, Ball and Roller Bearings . . . Grease Cups . . . Safety Collars . . . Shafting, etc.—everything from one source to make your materials handling and power transmission machinery operate at peak efficiency. Send for Catalogs.

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After 22 years service—

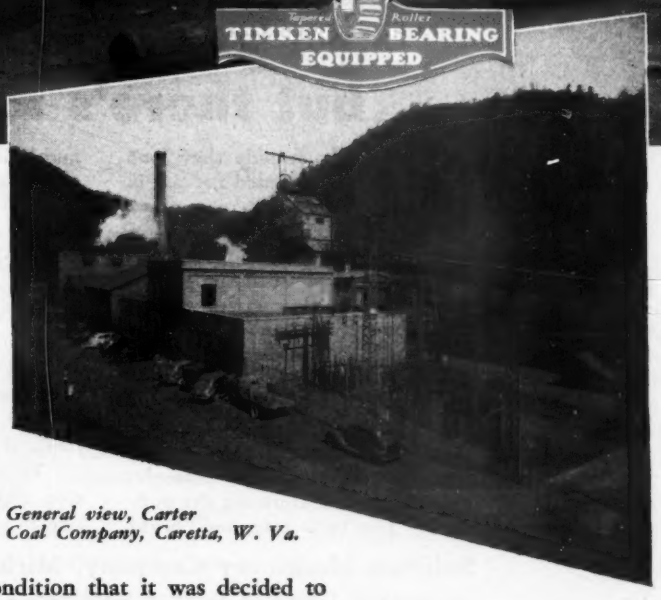
NEW MINE CAR BODIES BUT THE SAME

Timken Bearings

Left; new car body mounted on old trucks.
Right; old car after 22 years service.

It has often been said that Timken Tapered Roller Bearings frequently have been known to outlast the cars in which they are installed.

A notable instance of this is being experienced at the Carter Coal Company's No. 2 mine, Caretta, W. Va., where some Timken Bearing Equipped cars have been in service for 22 years.



General view, Carter Coal Company, Caretta, W. Va.

After this long period of operation, the replacement of these cars appeared necessary. However, examination of the car trucks — including the Timken Bearings — showed them to be in such splendid condition that it was decided to replace the car bodies only.

It will be noted from the photograph that much larger bodies than those originally used have been installed on the old trucks; this means that the loads on the Timken Bearings are greater than ever, but the bearings are taking them with the same sureness and dependability they displayed in their previous 22 years of operation.

Specify Timken Bearings for your mine cars and make sure the trade-mark "TIMKEN" appears on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

how to keep your Sullivan —use only genuine

...but there's a big difference

From the outside they look exactly alike and both are intended for use in a Sullivan coal cutter but one is a genuine Sullivan part and the other was made by a local machine shop. The owner of the coal cutter in which the genuine Sullivan part is to be used knows that he is assured of the same high performance guarantee that his original cutter carried. The user of the other part has no such assurance.

What is the difference between these two parts? The Sullivan part is made of steel of a special analysis to take care of fatigue and rupture through stretching, for example. The local machine shop, not knowing the purpose for which the part was intended, could make it of an entirely different material which would not give the same service and possibly could result in severe damage to other parts of the cutter.

Let's take a more specific example. Suppose the part had to be made of manganese steel. Sullivan engineers say that it is an alloy of 10 to 16% manganese with 90 to 84% iron and carbon (steel). The local machinist may bid on a 3 or 5% alloy which has none of the properties of genuine manganese steel. The result is obvious.

To insure yourself against loss of production from breakdowns due to spurious coal cutter parts insist on genuine Sullivan parts.

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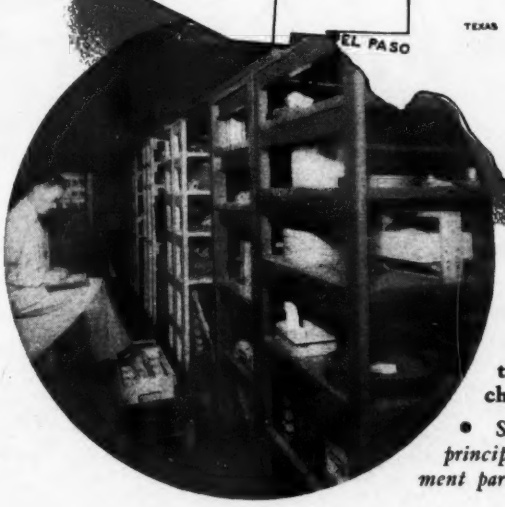
a world-wide organization...

coal cutters at top efficiency . . .

Sullivan renewal parts

genuine Sullivan parts . . . are easy to get!

There's a well-stocked renewal parts and service office located in every coal-producing section of the United States.



• **By ordering direct from the nearest warehouse, you can eliminate the long, costly delays and idle machinery that always run up the cost per ton. By insisting upon genuine Sullivan coal cutter parts you can be certain of keeping your Sullivan coal cutters performing at the same high standards of efficiency for which these machines are designed and built.**

• *Sullivan warehouses, conveniently located in all the principal coal fields, carry a full stock of replacement parts at all times.*

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products

Coal Mining Machines • Slushers
Rock Loaders • Hoists • Car Pullers
Air Compressors • Coal Drills • Rock Drills
Cutter Bit Sharpeners and Heaters
Core Drills and Contract Core Drilling.

Is your Job too tough for your truck?...

No matter how little it cost when new—if your truck is not tough enough for your job *it will cost too much in the end.*

There's only one "bargain" in trucking—and that's *extra work for your money.*

This is why Mack trucks are built the way they are. It's why, for instance, Mack uses Tetrapoid rather than conventional gears—rubber Shock Insulators rather than conventional spring shackles—wrist pins precision-finished to two ten-thousandths of an inch.

When you build a truck this way *it gives its owner extra work.* It stays on the job *longer.* It is in the repair shop *less. It costs less in the end.*

If your trucks give you too much trouble—if repair costs are excessive and service interruptions too frequent—then ask yourself if maybe you're not just using *too little truck for the job!*

If the answer's "*Yes!*"—then you need a Mack. It pays off in work on the job.

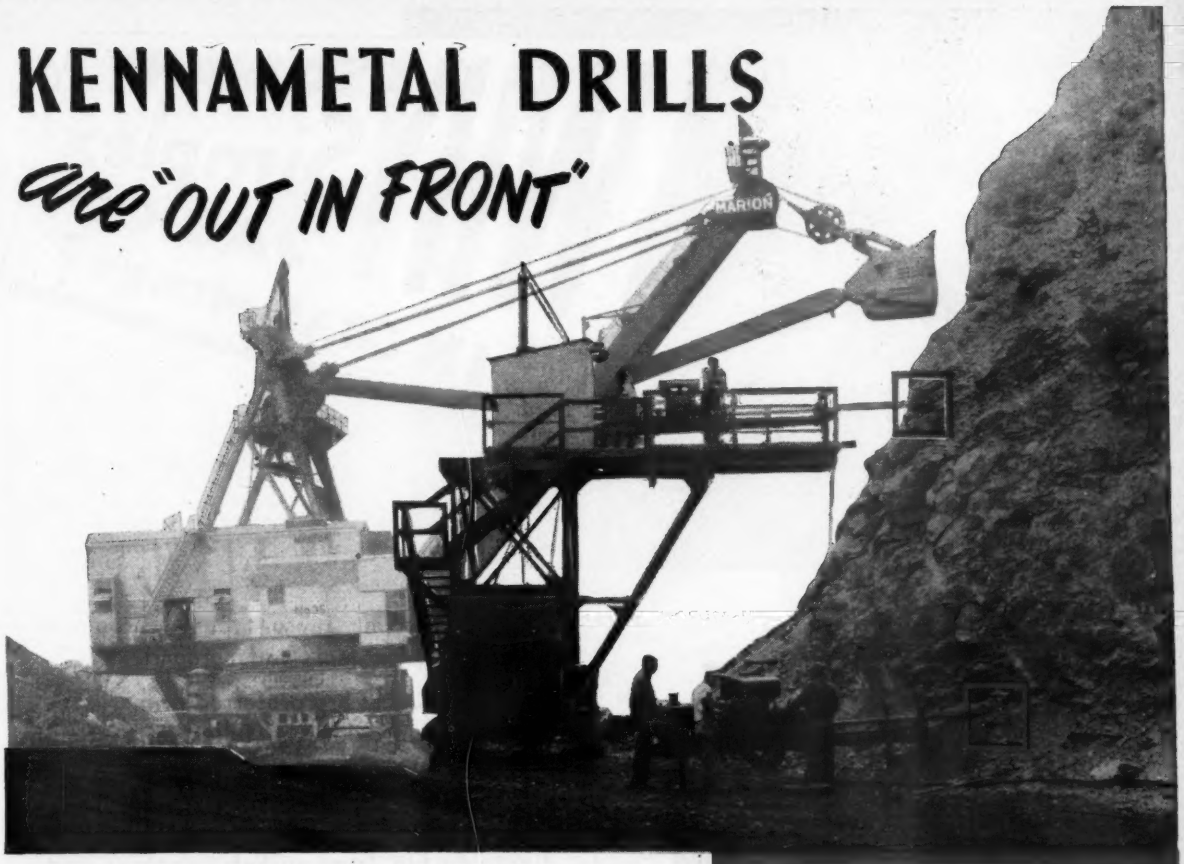
Mack Trucks, Inc., Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

Mack
TRUCKS
FOR EVERY PURPOSE

Performance Counts!

KENNAMETAL DRILLS

are "OUT IN FRONT"



Before the shovel, the shot . . . before the shot, the hole . . . before the hole, the DRILL.

If it's a Kennametal Drill, results are outstanding—more holes, faster, better, cheaper.

You pay less for Kennametal-drilled holes, in time, in man-hours, in power, in bit replacement and resharpening.

If you're using these bits now, you will know what we mean. If you're not, the following typical field experience will be interesting:

- In overburden consisting of hard shale matrix imbedded with large limestone nodules, a Kennametal 6½" diameter three-way bit put down 15 holes 60 feet deep in 390 minutes actual drilling time—an average of 26 minutes each (21 minimum, 35 maximum). After this 900 feet of drilling the bit was not dull enough to require resharpening!

Here are the reasons for such good service:

- These bits are revolutionary in type and design. They are *tipped with Kennametal,* the same hard, tough, durable cemented carbide that for years has produced outstanding results when used on metal-working tools.
- Cutting edges are scientifically contoured for fast drilling to accurate size throughout the bit life, including many regrinds. An effective core breaker helps to keep the hole clear and prevent bit stalling.
- Bodies are sturdy, heat-treated alloy steel castings having welded-in bar steel shanks, adaptable to fit common types of augers. Hexagonal type is standard, but square or splined can be furnished when ordered.

A small investment in Kennametal Drill Bits will help you realize the maximum returns from a large investment in shovel capacity for removing overburden in stripping operations.

Four sizes are available—3½", 4", 5", and 6½" diameters. Additional particulars, and prices, sent promptly upon request.

Photograph above shows excellent condition of Kennametal Rotary Drill Bit after being used for one month, drilling holes in customary Seam 8 overburden.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

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WHY SO MANY Simplex JACKS IN COAL MINES?

Simplex Ratchet Lowering Jack in use by cutting machine crew in Louise mine of Louise Coal Co.

Simplex General Purpose Mine Jacks

A size for seams of any thickness:

84A, 14" high, 7" lift
85A, 17" high, 10" lift
86A, 20" high, 13" lift

5-tons capacity. Toe lift on all sizes. Lift from a minimum height of 1¾". Other Simplex Ratchet Lowering Jacks in 10, 15 and 20-ton capacities.

There are definite reasons for the large number of Simplex Jacks underground.

Simplex Jacks are preferred primarily because they provide the fullest measure of safety. They are designed and built that way. The Simplex General Purpose Mine Jacks pictured embody the following safety features: double lever sockets, stronger cadmium plated springs and links, shorter fulcrum centers, longer and wider concave rack bar toe lifts, larger trunnion bearings, larger and stronger pawls, reinforced inner-ribbed housings and greater inbuilt strength.

These Simplex Jacks are fast operating and always efficient. They speed the handling of mechanical equipment and definitely help get out greater tonnages. They are standard for use with coal cutting and loading machines, re-railing mine cars and light locomotives, mine trackwork and for lifting and moving all types of mechanical equipment.

Send for Bulletin "Mines-41" showing mine roof jacks, roof timber elevating jacks, post-pulling jacks and other mine jacks.

TEMPLETON, KENLY & CO.,
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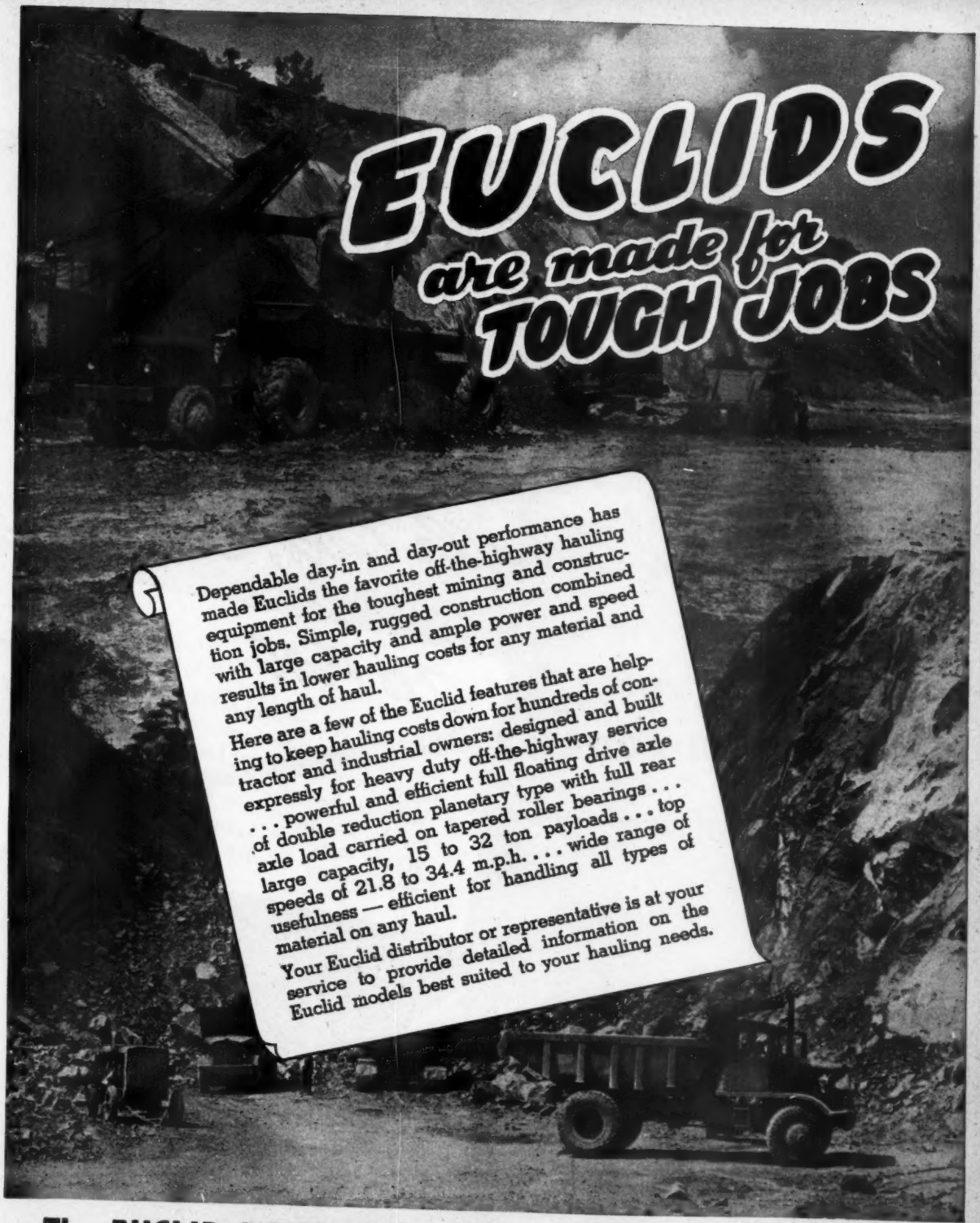
Better, Safer Jacks Since 1899
Simplex
LEVER · SCREW · HYDRAULIC
Jacks



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The EUCLID ROAD MACHINERY Co. • • • Cleveland 17, Ohio

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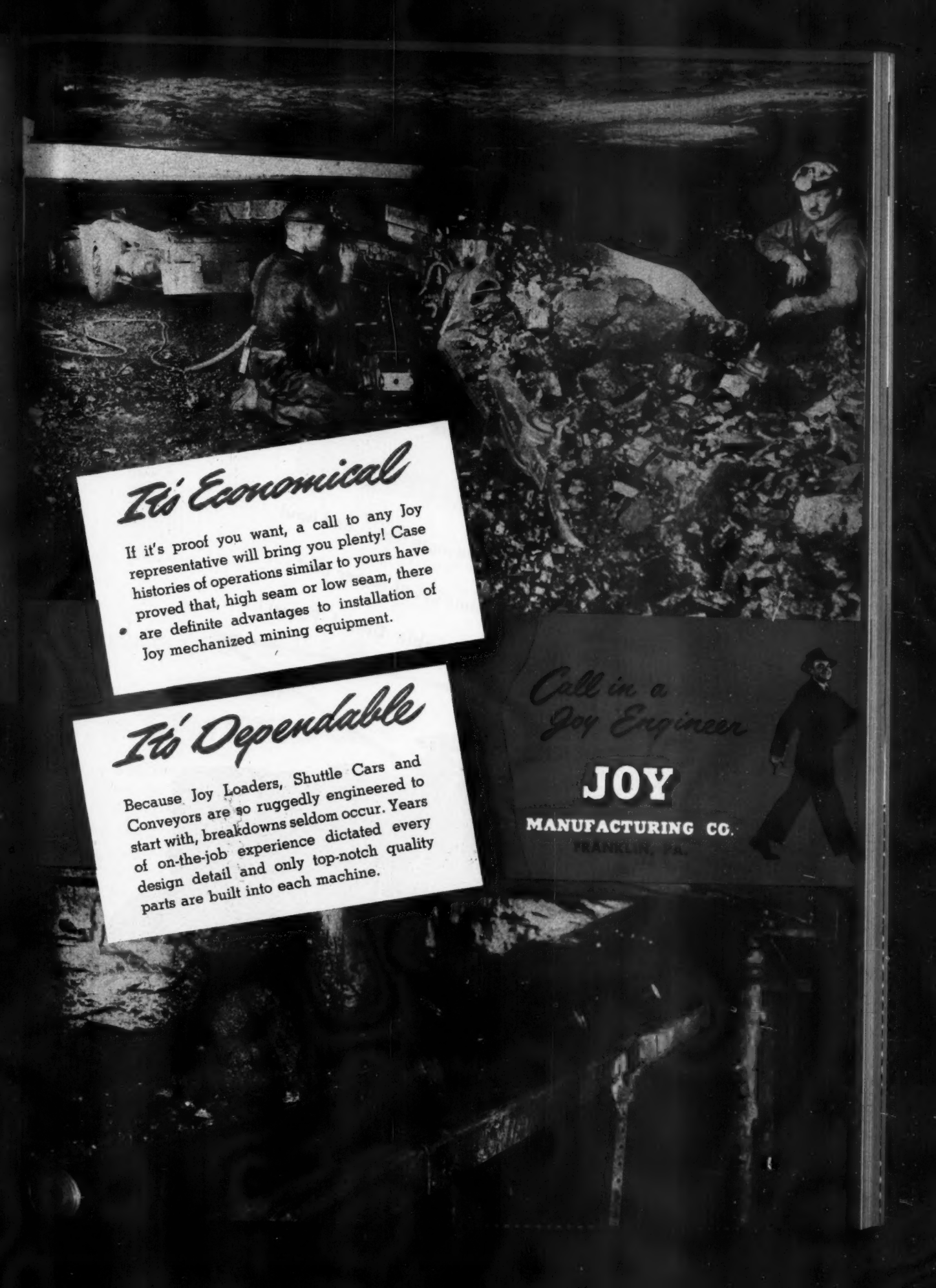
JOY MECHANIZED MINING

with Loaders, Shuttle Cars, Conveyors,

The nearest thing to "PUSH-BUTTON" COAL MINING TODAY

It's Fast

Individual ratings vary according to each machine's designated use . . . from the Joy Junior (very thin seam) Loader with a capacity of one ton per minute, to the large Joy 11 Bu, rated at 8 tons per minute. What's more, Joy Loaders are extremely mobile, easy to operate and maneuver.


It's Economical
If it's proof you want, a call to any Joy representative will bring you plenty! Case histories of operations similar to yours have proved that, high seam or low seam, there are definite advantages to installation of Joy mechanized mining equipment.
It's Dependable
Because Joy Loaders, Shuttle Cars and Conveyors are so ruggedly engineered to start with, breakdowns seldom occur. Years of on-the-job experience dictated every design detail and only top-notch quality parts are built into each machine.
Call in a Joy Engineer
JOY
MANUFACTURING CO.
FRANKLIN, PA.

Your equipment can move more dirt . . . and haul more ore . . . in less time . . . at lower cost . . . with Cummins Dependable Diesel Power!

PROOF! On the rich Mesabi Range, Cummins Diesels power more than 80% of the rubber-tired earth and ore moving equipment. Here's ample proof of profitable performance! Why not get *all* the facts on the proved economy, reliability and low weight per horsepower of Cummins Dependable Diesels? 150-200-275 hp for all types of mining operations. See your dealer, or write Cummins direct.

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

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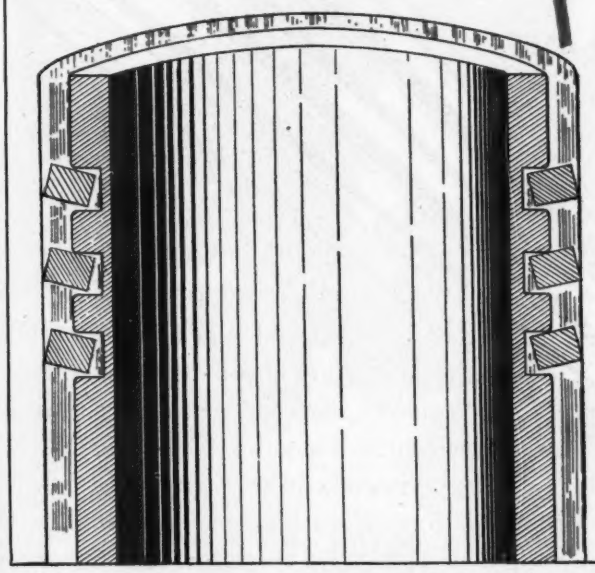

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"Rocking" piston rings, the result of excessive wear in the ring grooves of Diesel engine pistons, are the source of considerable lay-off time and expense to Diesel operators—Wear-enlarged grooves permit rings to rock, and "bite" into cylinder walls. The result is usually a costly overhaul to replace not only pistons, but worn liners as well. It's a danger point in many Diesels—but "rocking" rings and their cause, enlarged ring grooves, can be minimized.

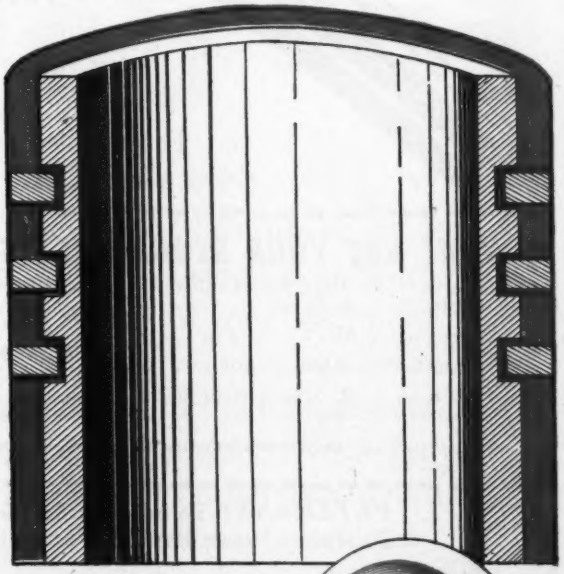
RPM DELO Oil clings to hot engine areas often left exposed to wear by ordinary uncompounded oils.

RING GROOVE WEAR REDUCED BY RPM DELO OIL

In a series of 1000-hour laboratory tests, Standard scientists proved that ring groove wear can be minimized with RPM DELO Diesel Engine Lubricating Oil.

Piston ring groove wear in an engine operated on a top quality straight mineral oil was thirty times that experienced with RPM DELO Oil in an identical test.

RPM DELO Oil reduces wear due to a metal-adhesion additive which makes it cling to and lubricate hot engine areas other oils often leave bare, and to other compounds which eliminate stuck rings and engine deposits, prevent bearing corrosion, stop oil foaming.



To match the fine performance of RPM DELO Oil use these equally efficient companion products from the same famous "RPM" line—

RPM HEAVY DUTY MOTOR OIL
RPM COMPOUNDED MOTOR OIL
RPM GEAR OILS & LUBRICANTS
RPM GREASES

RPM DELO — DIESEL ENGINE LUBRICATING OIL

For additional technical information write Dept. T-X, Standard of California, San Francisco 20, California, or California Commercial Company, 30 Rockefeller Plaza, New York 20, N. Y.

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Budget priced, these 50,000 tons consist of 25,000 tons of carbon and 25,000 tons of alloy H.R. & C.F. bars, in sizes to meet your immediate requirements.

In addition, there are 60,000 tons of carbon and alloy billets, blooms and slabs. These semi-finished products are also priced for quick delivery in meeting the demands for substitute uses. If you qualify for credit, terms may be arranged. For detailed specifications, grades, sizes, deliveries and F.O.B. prices, simply write, wire or phone the nearest RFC Agency listed below.

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VETERANS: **To help you in purchasing surplus property from the RFC, a veterans' unit has been established in each of our Disposing Agencies.**

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Agencies located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

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. . . now have adequate, efficient sales distribution

The Cleveland-Cliffs organization, seasoned by nearly a century of business experience, is set up to distribute the output of your operations. Experience has shown that our docks, our Great Lakes Vessel Fleet, our branches throughout twenty-six states and our trained and seasoned sales personnel provide the proper sales outlet with which to meet the demands of modern business economy.

CLIFFS Dependable COALS

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THE CLEVELAND-CLIFFS IRON COMPANY

UNION COMMERCE BUILDING
CLEVELAND 14, OHIO

HANDLES LIKE A *featherweight*

Fastest Hitting In Its Class!

NEW Thor ROCK DRILL

NO. 28—30 POUND SINKER

Thor's new *featherweight* hits faster and smoother than anything in its class!

Here's proof! Fifty different mines tested the new Thor "28" Sinker . . . *first.* And every one of these fifty operators immediately placed orders for the drill!

These operators *know already* the speed . . . plus the handling ease of Thor's "featherweight"—only 30 pounds complete. They *know already* that in the "28's" smooth compactness are all these same advantages of Thor's rock drilling heavyweights;

Short-travel valve *Powerful rotation*
Powerful hole blowing
Low cost, easily replaceable chuck

Ask for a demonstration of the "28" before you buy another rock drill!

The Thor "28" is furnished as pictured for wet or dry operation, with ⅝-inch hexagon or quarter octagon chuck. Thor's famous forged steel retainer (inset above) and side exhaust are optional equipment.

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600 W. Jackson Boulevard, Chicago 6, Illinois

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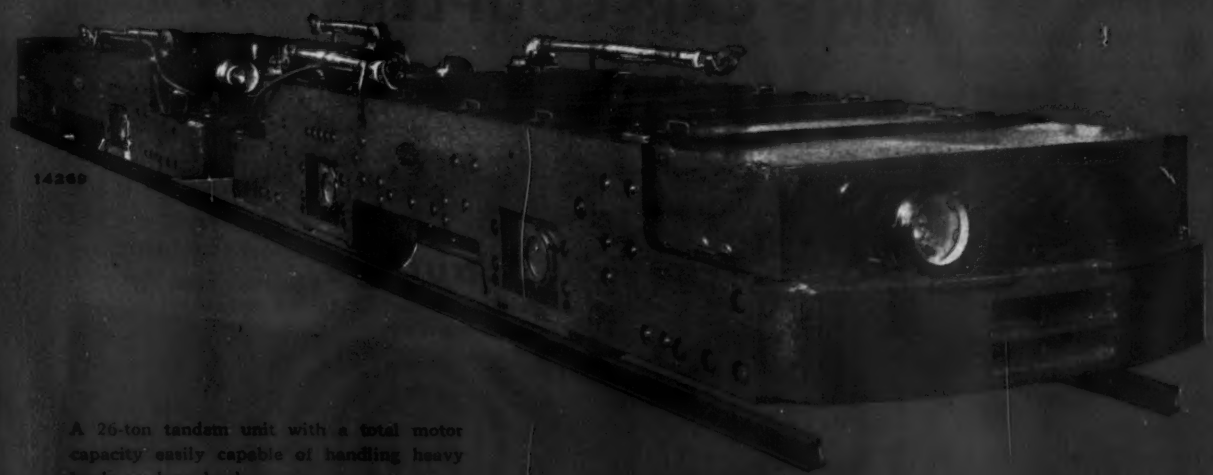
Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

GOODMAN *Mine Locomotives*

There are Goodman locomotives for any underground transportation system in coal mine, metal mine or tunnel and they are available in a wide range of sizes in trolley, trolley and reel, and storage battery types to assure a selection to suit your requirements.



A 26-ton tandem unit with a total motor capacity easily capable of handling heavy loads on long hauls.

Goodman has every facility for designing and building the best in electric mine locomotives and long experience with gathering and haulage problems that may be helpful to you.

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HALSTED STREET AT 48TH • CHICAGO 9, ILLINOIS

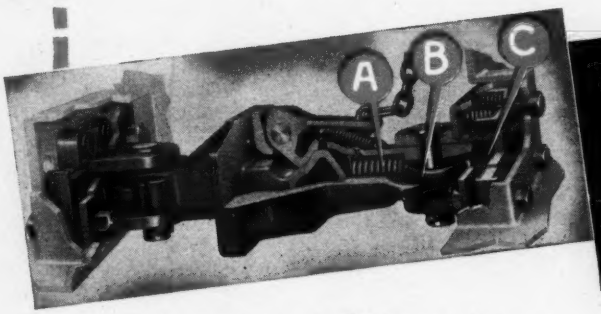
Locomotives • Loaders • Cutting Machines • Conveyors

Get the Advantages of

AUTOMATIC SELF-CENTERING
EXTRA-WIDE GATHERING RANGE

with O-B AUTOMATIC MINE CAR COUPLERS

Both are necessary to provide efficient, trouble-free mine haulage



Automatic Self-Centering

Eliminates need to go between cars to align couplers before cars bump together. Heavy spring (A) forces rear legs of floating ring (B) against seat (C) holding heads in longitudinal center with respect to car.

Extra-wide Gathering Range

Permits heads to couple automatically on all normal curves as well as straight track. The point on male head need only enter bellmouth of female head anywhere within its full fifteen inch length. The O-B Automatic Coupler does the rest.

For Your Next Mine Car Installation, Specify

O-B AUTOMATIC COUPLERS

Designed Specifically to Meet Mine Operating Conditions

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CANADIAN OHIO BRASS CO. LTD., NIAGARA FALLS, ONT.

Mining
CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress

Volume 32 FEBRUARY, 1946 Number 2

Where Reimbursement is Due

WHEN a mandatory order was issued October 8, 1942, shutting down the gold mines of the United States by direct Government edict, no provision was made for reimbursement. The shut-down order, L-208, was lifted July 1, 1945, but the more than two and one-half years of non-productivity has left many of the producers bankrupt or heavily involved, and in many cases the mines are in no condition to resume output. At the recent AMC Western Division meeting in Salt Lake City, the following resolution was adopted:

> "We favor legislation to reimburse gold mine owners and operators for capital losses and unreimbursed maintenance costs (including State and Federal taxes and interest paid on obligations) where such capital losses and maintenance costs resulted directly or indirectly from compliance with Limitation Order L-208 of the War Production Board."

Action has followed on the Engle-Murray bill to pay gold producers their out-of-pocket losses caused by the WPB order. Representative Engle of California and his War Claims subcommittee made a strong case at hearings on December 18 and 19, demonstrating conclusively through Dr. Wilbur Nelson, WPB administrator of L-208, and other competent witnesses that this arbitrary order closing the mines was a mistake on the part of Government, that it failed to accomplish its purpose and that the producers should be compensated for their losses. The Engle-Murray bill, together with amendments which have been proposed, makes perfectly clear the items for which payment is provided and leaves no uncertainties to be encountered in the fair administration of the law. Representatives and Senators from mining states and districts which have suffered under L-208 will continue to work to the end that justice be done to right this Governmental error and that mistreated gold miners be made whole where reimbursement is due.

Labor Legislation

RECENT House passage of the Case bill in answer to the serious national labor situation has focused the spotlight on labor legislation. This strong measure would replace "fact-finding" with a tri-partite board to mediate labor disputes over a 30-day waiting period. It specifies that collective bargaining contracts "be mutually binding and enforceable either at law or in equity against each of the parties thereto, with damage suits or injunction proceedings for contract violation." Forceable picketing is penalized and the status of supervisory employes, as representatives of management, is made clear.

Out of the cross-fire of charges and countercharges in the current labor disturbances a number of basic principles which must be established for the salvation of our free enterprise civilization are becoming increasingly clear.

First and foremost management must retain the right to manage and its function must not be impaired. High wages can be justified only by high productivity; limitations of output, slowdown, or make-work or featherbedding practices cannot be countenanced. Collective bargaining agreements must contain clauses prohibiting strikes and lockouts during the period of the agreement and the parties thereto must be responsible for their obligations in the Courts. The proviso in the National Labor Relations Act sanctioning closed shop agreements should be repealed and all men should have the right to work regardless of union affiliation or lack thereof. Violence and intimidation in connection with organization of unions or in connection with labor disputes should be prohibited by Federal and State law. The law should forbid employers to pay money to unions for any purpose with the exception of pay roll deductions from union members.

Parties to collective bargaining agreements should be permitted to define "worktime" in applying minimum wage and maximum hours provisions under the Fair Labor Standards Act; and employes working under a collective bargaining agreement providing for minimum wages higher than the legal minimum should be exempt from the minimum wage and maximum hour provisions. Legislation should be promptly enacted to place a limit of one year on the time for bringing action to collect back pay, "damages," and attorney fees under the Wage-Hour Act.

Senator Murray, of Montana, Chairman of the House Committee on Education and Labor, has stated that his committee, which now has the Case bill under consideration, will report a bill to the Senate. The opportunity is here for the Senate to join with the House in applying corrective action to a crisis which threatens harm to every person in the United States.

Annual Coal Convention

Cincinnati, Ohio
April 29–30, 1946

THE COAL INDUSTRY, having completed its wartime job, is now looking to the future, and a record attendance of operators and manufacturers is already indicated for the 1946 Annual Coal Convention of the American Mining Congress. This will be held at the Netherland Plaza Hotel, Cincinnati, Monday and Tuesday, April 29-30. Opening on Monday morning, the sessions will continue through Tuesday afternoon. There will be luncheon meetings on both days and the convention will culminate at the Annual Dinner on Tuesday night.

Postwar problems will of course be the main topic of discussion. It is true that coal mining has converted to peacetime operation without interruption to production and that coal tonnages are still maintained at a high level; however, difficulties do lie ahead and the papers at Cincinnati will consider how these may best be met.

The serious competitive position which coal is facing will be dealt with at the opening session on Monday morning. Men who are conversant with the fuel and power markets will point out what coal must do to meet the economic and operating advantages of other fuels—the convenience of oil and gas for automatic heating, and the efficiency of the oil-driven diesel engine. As a corollary to this discussion of markets, on Monday afternoon operators and manufacturers of preparation equipment will explain how present methods will be improved and new processes devised to furnish high-quality coals for every type of consumer service.

Tuesday morning and afternoon will be devoted to operating problems, with concurrent sessions for deep and open-pit mining. The papers will cover a wide range and their scope will extend beyond the practices of any one company; equipment manufacturers will contribute technical data and discussion speakers will amplify each subject. The program as thus far arranged by the Program Committee is shown herewith and an announcement of the speakers will be made in the near future.

Program

MONDAY MORNING—COAL'S FUTURE

ECONOMIC PROBLEMS OF THE COAL INDUSTRY

A discussion of the factors that will determine the division of the future markets for heat and power between coal, oil and natural gas.

LOCOMOTIVE FUEL ECONOMICS

A comparison between steam, electric and diesel locomotives for main line passenger and freight haulage and for switching service—future trends in railroad motive power.

ECONOMICS OF DOMESTIC HEATING

Explaining how coal must compete against the convenience of oil and gas for residential use—further development of stokers to give more complete automatic service—possibilities of central heating.

MONDAY AFTERNOON—COAL BENEFICIATION

COAL PREPARATION

A discussion of coal cleaning practices and results by conventional wet and dry methods and by new processes, giving special attention to meeting the requirements of postwar fuel markets.

COAL DRYING

Describing various mechanical and heat methods and equipment as applied to coals in different fields; the effect of high moisture on quality of product.

COAL SCREENING

Developments in anthracite and bituminous fields to improve preparation efficiency for small sizes and make high grade industrial and domestic fuel.

TUESDAY MORNING—DEEP MINING

THIN-SEAM MINING—

Mechanical loading in low coal with mobile and stationary machines; also hand shoveling in face conveyors. Various cycles for face work.

MAINTENANCE—

For all classes of mining and tipple equipment; repairs done on the job, in underground shops and surface shops; methods of handling lubricants to eliminate waste.

THICK-SEAM MINING—

Track and tractor loaders with mine cars and shuttles for service haulage; face preparation methods to increase productive time of machines.

TUESDAY AFTERNOON—DEEP MINING

MANAGEMENT—

Modernizing the mine organization and improving the standards of management; personnel training for foremen.

SAFETY—

"Does Safety Pay?" will be answered by accounts of accident prevention measures that have reduced fatalities and injuries.

TRACK HAULAGE—

Economic and operating factors of mine haulage with equipment and track construction designed for mechanical operations.

BELT CONVEYORS—

For panel entries and main line service; practical and economic limits for belt length, speed and carrying capacity.

TUESDAY MORNING—STRIP MINING

STRIPPED LAND RECLAMATION—

A symposium—with speakers from several coal mining states—on methods for restoring and reforesting spoil banks and strip pits. Practices in level and mountainous terrain. Full floor discussions to develop practicability and economy of various tried and proposed reclamation measures.

TUESDAY AFTERNOON—STRIP MINING

FUTURE USE OF RUBBER—

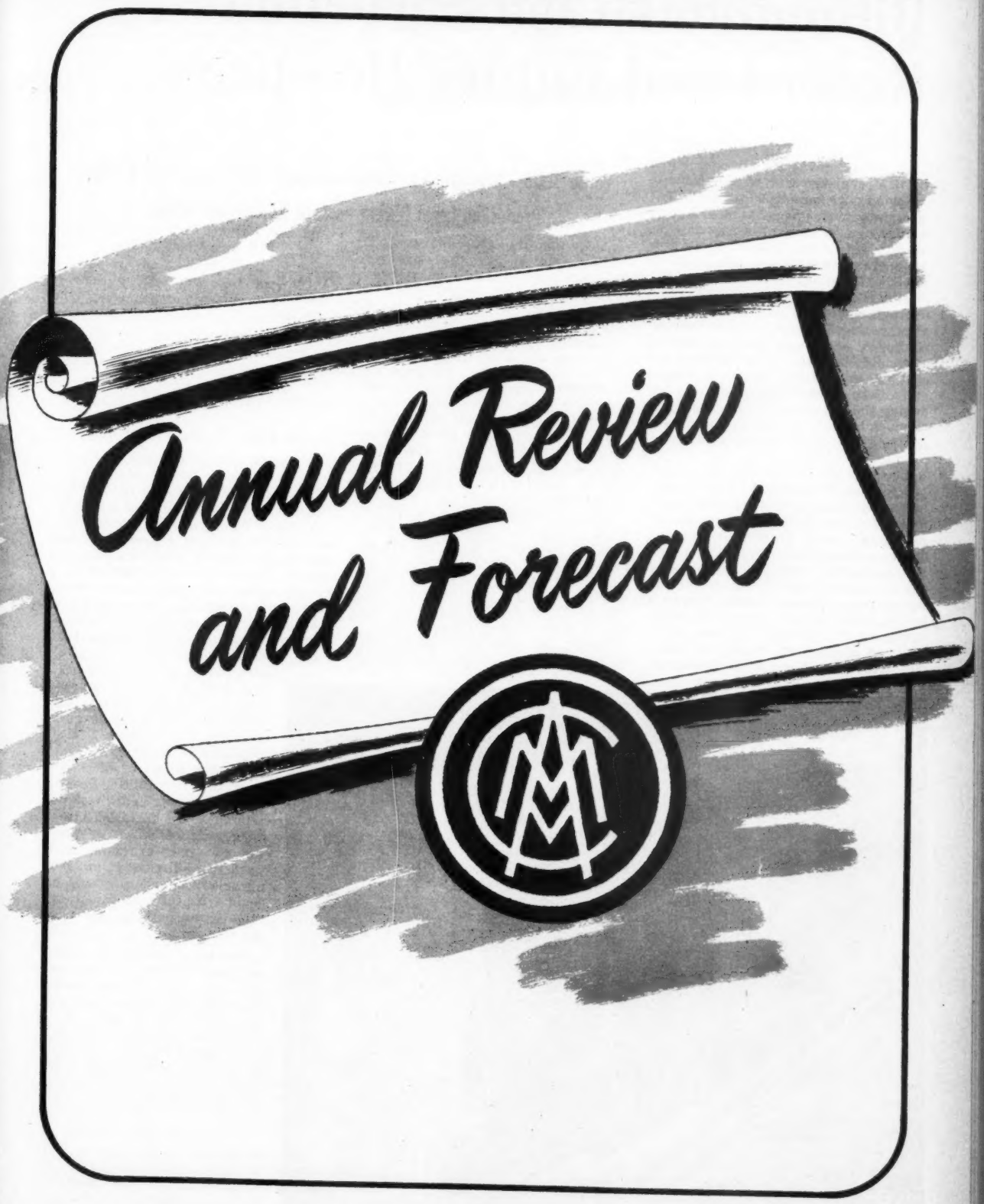
Possible advantages for strip mining from further developments of rubber tires and tractor treads for various classes of equipment, from light trucks and tractors to heavy shovels.

DRAGLINES—

Large capacities and wide casting ranges of the new type draglines will increase the economical overburden limit and add to the acreages practicable for strip mining.

TWO-SEAM STRIPPING—

Describing methods of recovering two coal seams in one open-pit operation, showing methods and equipment for removing overburden and loading the coal.


Annual Review
and Forecast

Bituminous Coal's Wartime Record and Future Prospects

Large Scale Manufacture of Consumer Goods Will Keep Coal At High Production Level During Postwar Adjustment Period

By R. E. HOWE
President
Appalachian Coals, Inc.

THE achievements of the bituminous coal industry during the recent global war, under the most trying conditions ever experienced by any industry, will go down in the annals of history as a magnificent contribution to ultimate victory. With a constantly diminishing labor supply, with the average age of available employes approximating 50 years, with additional equipment and repair parts all but unobtainable at times, the bituminous coal mines of this country produced more than 3,000,000,000 tons of coal during the war period. This is almost as much bituminous coal as was mined during the first 100 years of recorded production.

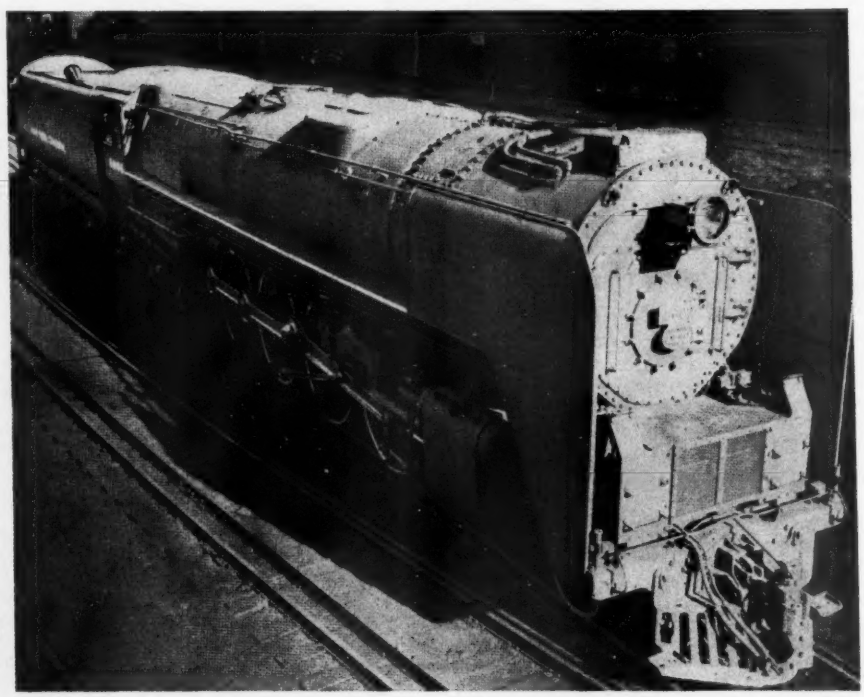
The railroads of the country transported some 85 per cent of this total, or nearly two and a half billion tons, and performed this great service with maximum convenience to both producers and distributors, and to the consuming public. The retail coal merchants of this country deserve special praise and commendation for the manner in which they overcame almost insurmountable obstacles and inconveniences in distributing nearly 600,000,000 tons of solid fuel to domestic consumers and an additional 150,000,000 tons to the tens of thousands of small war plants and civilian concerns. In a truly magnificent manner the bituminous coal industry in all its branches, and the railroads, have, during this global war, established an enviable record for posterity.

And now what about the future? Is history repeating itself as to general business conditions, as to the bituminous coal industry? What of the future of the coal industry? To be specific, what of the postwar period 1946 to 1950? The author of the trite saying that history repeats itself is unknown, but that observation forms the best known basis of forecasting future trends, and, in many instances, of predicting future events themselves.

The Past Tells The Future

If it can be agreed that the basic likes and dislikes, the needs and desires of human nature do not change fundamentally from generation to generation, or from period to period, then we may accept the proposition that history does repeat itself in major respects. Styles in clothing and in furniture rotate from colonial to "modern" and back again; choice of a home may call for a Cape Cod cottage or a mansion, modernistic or colonial; during periods of industrial activity rural inhabitants flock to the city, and during period of depression city dwellers flock to the country. Even styles in government run in cycles, from republics to Nazism, Facism, and other forms of dictatorship to "Controlled Economies" and back again to true republics. In fact, until the "synthetic" creation of plutonium from uranium, and until the discovery of the miracle products of coal, it could truthfully be said that "there was nothing new under the sun."

The basic reasons for these cyclical changes over periods of time remain pretty much the same, and they appear to repeat themselves along general patterns as time goes on. As someone has so aptly put it, "Human nature does not change—there are just more of us." Consequently, the



A trend in the right direction—New coal burning locomotive of New York Central

more one tries to isolate the facts of the present business situation and demonstrate how far conditions today differ from those which prevailed after World War I, the more evident it becomes that the differences are only of degree. We are justified from this in arguing that inflation and deflation will follow World War II in normal course, just as they have followed previous wars, and our major question is that of determining the timing.

There is a strong feeling in some quarters, of course, that the old laws of economics have been repealed and that government hereafter will impose its will on the business cycle. Under various guises, proposed legislation and government-controlled programs are offered to sustain business volumes over the years ahead, ironing out the valleys, forestalling future let-downs by advance planning, and likewise preventing those occasional bursts of over-confidence in which the business world seems at times to indulge.

Factors for Inflation

Wars, of course, are always inflationary. The civilian economy denies itself many things to produce the goods which are utterly wasted in warfare. Due to civilian shortages and the demands of war itself, prices shoot upward. After a few years, as supply and demand once more equalize, there ensues a long decline in price levels. After previous wars, the average duration of this deflationary period ranged from 12 to 30 years. The shortest of these declines came after World War I. But the accumulated demands from this war are so vast that they will hold prices up during what would ordinarily be the first stages of postwar deflation. The picture today is one of extraordinary complexity, and there are inflationary forces now evident with which neither the United States nor any other strong economy has ever previously contended.

First, the money supply has not only been vastly increased in the past few years but it is likely to increase for a number of years. The United States' money supply alone (cash and bank deposits) has risen from $65 billion prewar to almost $170 billion now. Continued, though reduced, deficit spending, plus gold imports, plus new bank loans, plus cashing of war bonds by corporations, and individuals, to finance new needs will further increase the spendable supply of money.

Secondly, the demands of our own people for "things" are greater than ever before. This includes not merely adequate new housing, and new autos, but also new highways, new utility facilities, and the new gadgets of modern life. Even maximum production for three years would not entirely fill the gap created by a four-year dearth of new supplies.

Thirdly, the world will call upon us for greater supplies of those capital facilities — machinery, etc., etc. — of which the United States is the preeminent producer. The world now has in gold and dollars some $30 billion available for this purpose. Additional money—possibly $25 billion at a minimum estimate—will become available from new gold production and new credits of all sorts—private commercial banks, Export-Import Bank, Bretton Woods Bank, etc., etc. To this will be added, of course, the proceeds of the goods and raw materials imported by us.

Thus, we have the materials for inflation—an unprecedented money supply, plus vastly enlarged potential demands. Will, then, the inflation forces held so firmly in check during the war now burst forth, creating tremendous pressure for higher prices until the accumulated needs are satisfied or, and this is our real dread, will prices be pushed so high as to stifle these demands, both domestic and foreign?

Going back to the analysis of history, we find that World War I was followed by a brief readjustment period and then by an inflationary burst, only to be followed by a sensible price deflation and more satisfactory operation on a lower plateau of sustained prosperity. Consequently, a substantial period of high business levels was possible before speculative excesses forced a delayed major liquidation. Our experience after World War II could parallel this in certain major aspects. Both the need—at home and abroad—for goods and the supply of money available are tremendous. The United States will, in fact, require tremendous new capital facilites of certain types, even on top of our wartime expansion, to fill these demands.

The initial period of postwar prosperity, then, could readily run a minimum of five years. There may be, and indeed chances favor, a sharp intermediate price scare somewhere in this period, as after World War I, but it should not long retard the major trend. Political cure-alls, introduced from time to time, could also cause temporary panicky spells. But the essential facts—demand for goods and supply of money—argue for a relatively long period favorable to business as a whole.

For 1946-1950, therefore, the prospect is for an unprecedented volume of national production in an economy which could readily go berserk because of an oversupply of money. Drastic deflation, the type that could produce another 1932, is not in prospect *within* that period unless there is "no end" to labor's demands; unless inflationary commodity prices get wholly out of hand resulting in buyers' strikes similar to those of 1919-20; and unless private enterprise loses all confidence for reasons not now discernible.

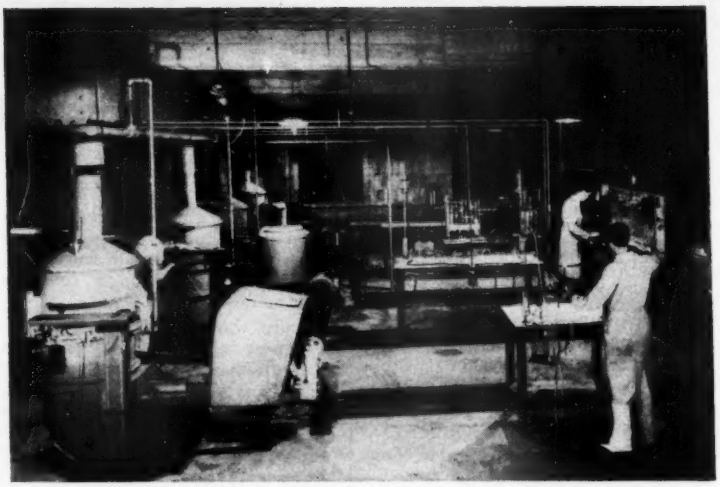
Is History Repeating In The Coal Industry?

Casting aside all wishful thinking, let us look at the record. With general business during the 1914 development stage of World War I at depression levels, coal production that year declined to 422,703,970 tons, some 12 per cent below the year previous. During the 1938 formative period of World War II, the country was in the midst of the New Deal "recession." Coal production that year had fallen to 348,544,764 tons, again a decline from the previous year, in this instance amounting to approximately 22 per cent. Strange as it may seem, f.o.b. mine prices during 1914-15 and during 1938-39 followed the same identical patterns—declining because of uncertainties prevalent in each period.

Work stoppages were prevalent in unionized fields (Central Competitive Field of Indiana, Illinois, Ohio, Pennsylvania, etc.) during World War I. Similar experiences during World War II are too recent to require emphasis. The similarity of the two periods is further evidenced by the fact that in each postwar era the UMWA brought about a strike in the fall of the year. Regulation of distribution and maximum price regulation followed substantially the same pattern in each war. Exports of coal to Canada and other countries followed the same general course in each war, rising rapidly throughout each period. The peak of exports in World War I was reached in the second postwar year of 1920, although exports to "all other countries" doubled during the first postwar year. Apparently the same general pattern is being followed in the present instance.

Oil and gas threatened our very existence after the previous war—as

now. There was the usual talk that within a few years the coal industry would be a thing of the past. Of course in the first instance we had not "conquered" atomic energy! However, population growth, improved coal-burning equipment and techniques, eventual lower delivered costs, faster and more satisfactory distribution, both from the mines and from retail yards, will in the long-run work to the public's advantage now, as they did then, to assure the survival of the coal industry. Furthermore, it will likely be found that once more there is room in our growing country and in our expanded economy for any and all types of economically sound fuels—but the fight for first place among them must go on.



Coal's future lies in laboratory research

Vast Future Market for Fuel

Postwar competition in the marketing of fuels is already shaping up, with the lines pretty well drawn. It may be said in favor of coal that vastly improved heating equipment is definitely on the way. Bituminous Coal Research, Incorporated, the Bituminous Coal Institute, Appalachian Coals, Incorporated, National Coal Association, and others of the coal industry will continue to acquaint the public with the merits of coal-generated heat and power.

The pent-up demand for both temporary and durable consumer goods, and for capital equipment with which to manufacture these goods, has reached prodigious proportions. The requirements of this country alone are sufficient to assure high production levels for several years, once we are through the current, temporary, postwar readjustment period. World-wide demand for American goods is absolutely unmeasurable. In America, many items of food, clothing, tires, etc., are all but unobtainable. Inventories of such items are non-existent. The housing shortage has already reached calamitous proportions. Autos, office equipment, and certain heavy goods are in short supply. It will take years to replace inventories as well as to supply existing demand.

Coal is now an integral part in the manufacture or processing of practically all items needed for the peacetime economy, both non-durable and durable. Consequently, with a net growth in population of over 8,000,000 people between 1940 and 1945, with their greatly increased wants and needs, a sustained high level of demand for bituminous coal is in prospect by reason of our own pent-up demand for goods. Adding further to sustained demand for bituminous coal as time goes on will be new and accelerated uses such as new chemical processes and new products from coal.

	1946	1947	1948	1949	1950
Electric Power Utilities	68,000,000	76,000,000	72,000,000	74,000,000	74,000,000
By-Product Coke Ovens	80,000,000	89,000,000	85,000,000	87,000,000	87,000,000
Beehive Coke Ovens	3,000,000	3,300,000	3,100,000	3,200,000	3,200,000
Steel & Rolling Mills	10,000,000	11,000,000	10,500,000	10,800,000	10,800,000
Coal Gas Retorts	2,000,000	2,200,000	2,100,000	2,000,000	2,000,000
Cement Mills	6,000,000	6,700,000	6,400,000	6,600,000	6,600,000
Railroads (a)	110,000,000	115,000,000	110,000,000	105,000,000	100,000,000
Add. Known Consumption	2,000,000	2,500,000	2,000,000	2,400,000	2,400,000
Bunker Fuel (b)	2,000,000	2,300,000	2,100,000	1,500,000	1,500,000
Other Industrial Uses (c)	110,000,000	122,000,000	116,800,000	115,000,000	115,000,000
Sub-total Industrial	393,000,000	430,000,000	410,000,000	407,500,000	402,500,000
Retail Deliveries: (d)					
Residential	90,000,000	95,000,000	90,000,000	90,000,000	85,000,000
Commercial	20,000,000	25,000,000	20,000,000	20,000,000	15,000,000
TOTAL U. S. DEMAND	503,000,000	550,000,000	520,000,000	517,500,000	502,500,000
Exports: (e)					
To Canada	18,000,000	20,000,000	19,000,000	17,500,000	17,500,000
To all others	14,000,000	10,000,000	5,000,000	5,000,000	5,000,000
GRAND TOTAL DEMAND	535,000,000	580,000,000	544,000,000	540,000,000	525,000,000

(Five-Year Average Demand—545,000,000 tons)

(a)—Adjusted account Diesel competition.
(b)—1949-1950 adjusted account declining export business.
(c)—Adjusted account increased use of electricity but partially offset by new uses.
(d)—1948-1950 adjusted account inroads of competitive fuels and electric power.
(e)—Decline due to recovery of foreign productive ability and consequent return to world trade by subsidized shippers.

	1946	1947	1948	1949	1950
Prospective FRB Index Trends	165	185	175	180	180

The Germans are known to have produced edible fats and cooking oils from their low-grade coals. Of even greater immediate possibility is increased use of coal in greatly expanded demand for central heating plants in both business and residential districts, especially in future developments.

Air-conditioning is on the threshold of great expansion. In fact, it is conceivable that the office and home of the future will be neither rentable nor salable unless satisfactory "indoor climate" is provided wherever or whenever outside conditions are not conducive to comfort and good health. Central air-conditioning plants are not at all fantastic in this fast moving age. However, the means of air-conditioning, namely the greatly expanded use of coal in the larger units in summer as well as in the winter, is definitely in the picture, and will contribute to sustained demand for coal.

World requirements for our goods and necessary coal exports merely add to the probability of sustained demand for coal during the next several years. To transport these needed goods will require more coal by the railroads.

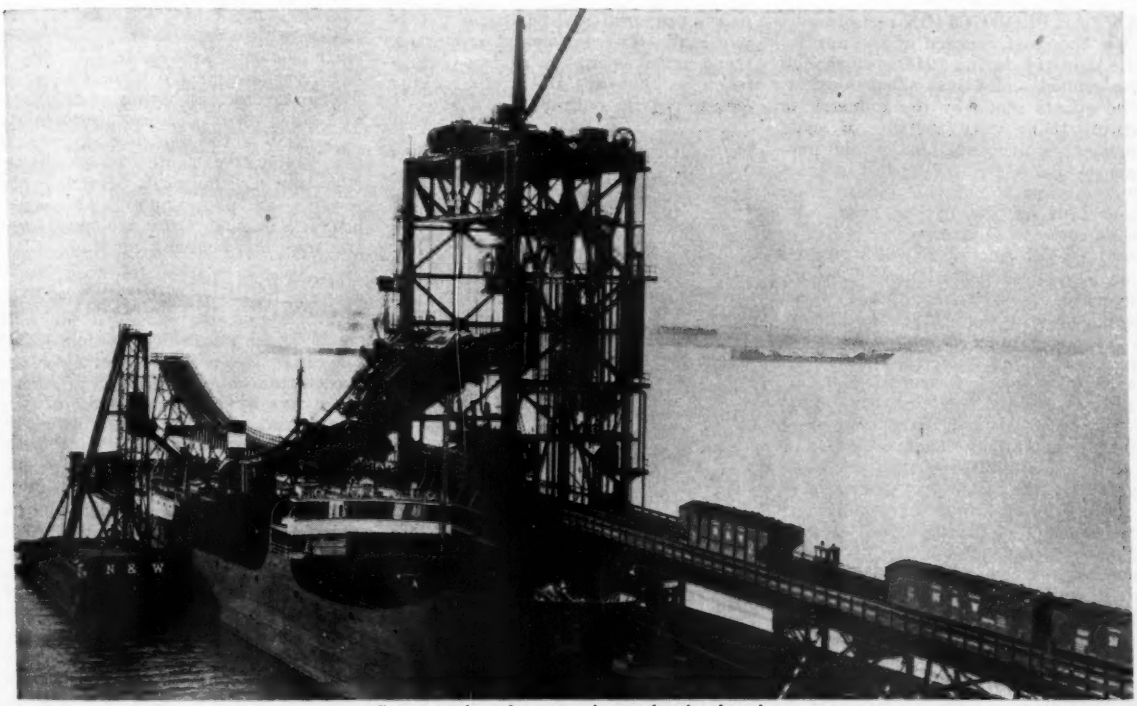
Looking Ahead

"One man's judgment is as good as another's" is undoubtedly true if his premises are sound, and therefore the reader should arrive at his own particular conclusion. The probabilities of success in many current fantastic attempts to break down the inevitable long-range effect of the Law of Supply and Demand are indeed small. Therefore, we believe the trends indicate that history will repeat itself along broad lines in the coal business but with the usual differences in degree, due to population growth, inflationary trends, export shipments, etc.

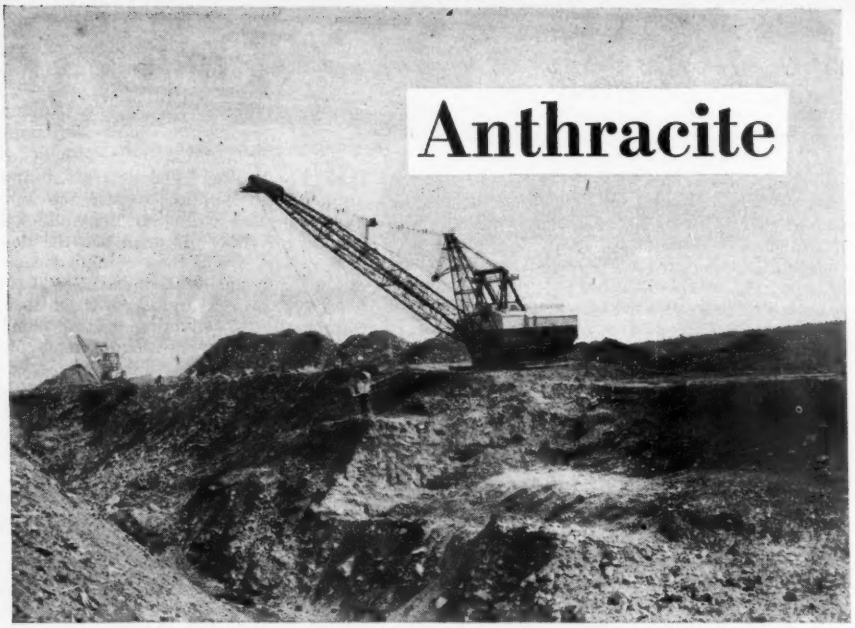
On this basis, and giving effect to recovery soon from our current industrial labor upheavals, we believe that there will begin during 1946 the characteristic postwar boom, reaching its peak in 1947. Following this upsurge in both industrial production and inflationary prices, a Primary Postwar Depression may be under way by early 1948, but it should be short-lived by reason of that year being a "pump priming" presidential year. Before 1948, as developed during 1920-21, there will be public resentment against rapidly rising costs of houses, food, and other necessities of life. Necessary readjustments to a somewhat lower plateau of business activity should follow. Something resembling a Secondary Postwar Era of Prosperity should then set in for a few years. Eventually, however, the Law of Supply and Demand will again make itself felt, with the probability that accelerated productive ability gained from wartime experience will have supplied principal demands by the end of 1950. If such are the developments, it will then become a case of the "survival of the fittest."

As for the coal industry, the fittest will be those production units which, through management, equipment, or natural conditions, will have reached the most economic level of production costs, and which will have in operation the most efficient preparation plants. As for sales, the fittest will be those concerns, both wholesale and retail, who have in the meantime enhanced the public's goodwill through exemplary service in equitably distributing the most satisfactory product possible, at the fairest but reasonably profitable price.

Here is the coal industry demand picture as we see it for each of the years 1946 through 1950. For those who have or will qualify for survival, it is reasonably favorable despite the vicissitudes which may be encountered on the way. Bituminous coal production will of course vary from year to year, as coal inventories may fluctuate, and as the long-term (1950 plus) economic trends unfold.



Export coal—a future market to be developed



Anthracite

War's End Leaves Industry With Many Problems in Meeting Competition

World's largest dragline highlights anthracite stripping progress

By WILLIAM H. LESSER
Pierce Management

WAR PRODUCTION records were the chief concern of the anthracite industry during 1945, even though the conflict ended just after midyear. The efforts made by the industry to attain them were worthy of commendation, because many developments adversely affected the productive capacity of the mines. Most important on the list of production decelerators was a strike of 17 days during which time there was a production loss of 3,500,000 tons. Other unfavorable operating conditions were: Manpower shortage, absenteeism, and a lowered productive efficiency of the workers. But despite all the vicissitudes of management, definite progress was made during the year. New mines were opened, new strippings started, old mines rehabilitated, and many new engineering projects forecast or completed.

It is estimated that the commercial production for 1945 will be around 52,000,000 net tons. This tonnage represents a reduction of 15 per cent when compared with that of 1944. Table I shows the anthracite production, and working time for the past several years.

An analysis of the percentage of sizes shipped in 1924 and 1944, a period of 20 years, shows a reduction in the prepared coal percentage of 17 per cent. The downward production trend in these sizes is pertinent inasmuch as they are the profit making fraction of the output.

Labor

Negotiations for a new wage scale were brought to the attention of the anthracite coal consuming public by the suspension of operations on May 1. This action was taken after a member vote, April 26, of six to one in favor of a strike. Even after the Government asked the men to continue working, the strike continued for 17 days. In addition to a production loss of sufficient domestic coal tonnage to heat around 400,000 average homes during a heating season, each of the 78,000 workers lost $150 in pay. Interruptions in the fuel supply, such as the foregoing, create a consumer complaint which results eventually in a shift to competitive fuels.

Never before have labor and management relations been so important, and they will become increasingly important as the industry approaches the competitive conditions which existed during the past. Raising the productivity per man to 3.2 tons appears to be one of the problems forefronting the postwar period.

TABLE I
COMMERCIAL ANTHRACITE PRODUCTION

Year	Days Worked	Commercial Production Net Tons
1917 (record high)	287	89,171,000
1924 (normal)	274	80,291,000
1936	192	51,875,000
1937	189	49,185,000
1938 (record low)	171	43,786,000
1939	183	49,073,000
1940	186	49,229,000
1941	203	54,107,000
1942	239	57,969,000
1943	270	58,270,000
1944	292	61,516,000
1945 (estimated)	...	52,000,000

Labor Relations

A management forum was inaugurated by the Pennsylvania Coal Company. It is designed to bring management and human relation problems more directly to all branches of the managerial force. At first, a series of lectures presented industry's problems as they have developed during the years. The second period of the Conference Plan will be handled by the superintendents, mine foremen, and their assistants.

During the year the Susquehanna Collieries Company held a series of conferences with each colliery's supervisory force for the purpose of studying the subject of personnel and supervisory organizations, together with their coordination. Also, a course in mining, as a major branch of the voca-

tional training course of the Shamokin High School, was started in conjunction with the mining industry.

A training plan to get young men to enter the industry was undertaken by the Lehigh Valley Coal Company. The plan will place prospective mine workers under competent supervisors for an intensive training course. The trainee will be paid the regular standard rates while being trained. When the course is completed, the men will be employed as miner's helpers until they gain sufficient experience to become a miner in accordance with the state's requirements.

Preparation

Even though procurement difficulties retarded construction programs, the following new breakers were placed in operation: Otto Collieries Company, Ashland; Blackwood Coal Company, Minersville; D and F Coal Company, Minersville; and the Northwest Coal Company, Carbondale. These breakers are cleaning material from refuse banks, and more coal of this character is being shipped now than ever. The coal reclaimed from refuse banks since 1940 is shown in Table II.

TABLE II

PRODUCTION FROM REFUSE BANKS

Year	Production (Tons)
1940	764,000
1941	1,076,000
1942	2,648,000
1943	5,028,000
1944	6,128,000

Of interest to the anthracite industry is the recent heavy-media separation process developed by the American Cyanamid Company. A pilot plant was built at the company's laboratory, Stamford, Conn., and there, several sizable samples of anthracite coal were tested. The tests were witnessed by prominent mining men, and they demonstrated beyond a doubt the coal cleaning ability of the process.

The heavy media in the foregoing process consists of magnetite ore ground to a fineness of 50 to 60 per cent through 325 mesh. The high specific gravity of the ore and its fineness make possible a magnetite-water mixture of 2.50 gravity. Loss of iron ore is kept to one-half lb. per ton of feed, because it can be flocculated and removed by magnets.

Test runs indicate the obtaining of these important results: good separation between 1.25 and 2.50 specific gravities; exact gravity control; and the ease of changing the gravity of the mixture quickly, to meet a quick change in quality of feed.

The outstanding development in preparation technique in the anthracite industry during the immediate past is the oil flotation process placed in operation by the Lehigh Navigation Coal Company, Inc., Lansford. It was designed to make marketable a small size, never before having a market value. Previously coal of this size found its way into the streams, and was the cause of stream pollution.

Much cleaning equipment was placed in existing breakers for the purpose of cleaning No. 4 and No. 5 buckwheat. Thus a market was found for sizes polluting the streams.

The type of cleaning equipment placed in new cleaning plants during the year shows no radical changes from that used during the recent past. Wilmot hydrotators, Chance cones, Menzie cones, and super duty Diester tables; all were used under the conditions best suited for their application.

To improve the ability of men to pick slate from the run-of-mine picking tables, new and better lighting has been adopted. The new light accentuates the difference in sparkle between slate, bone and coal.

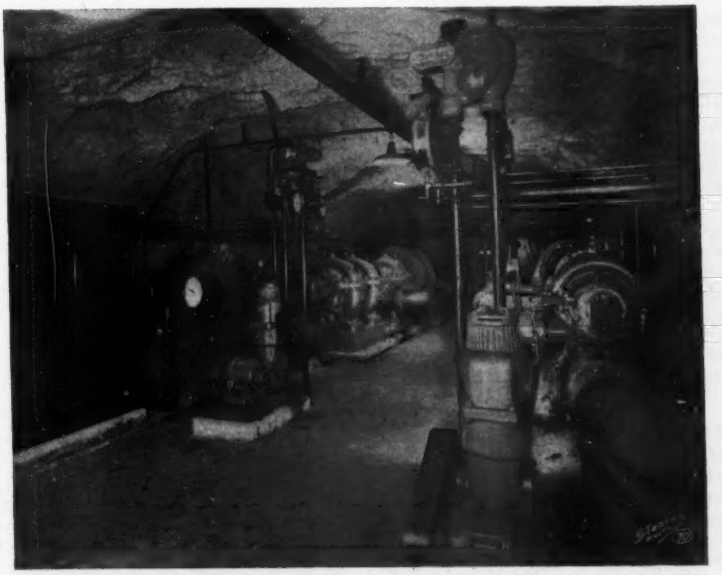
Pumping

Of definite concern to the anthracite industry is the water situation, not only because the pumping cost is about ten million dollars annually, but because of the many large pools of water in abandoned mines which constitute a distinct menace to the mines underneath them. In 1932 two pools of that type existed in the Northern Field, and in 1944 their number had increased to 26. These pools are now estimated to contain twelve billion gallons of water. In the Southern Field, between 1923 and 1940, the abandonment of mines resulted in the flooding of about 60 sq. miles, or 30 per cent of the field area.

Even though the rainfall has not changed appreciably during the past, the water to be pumped from the mines has increased because of surface breaks, strippings in outcrops, bootleg holes, and the inflow of water from adjacent abandoned mines. Pumping records, in 1920, from a group of collieries show that 8.4 tons of water were pumped per ton of coal produced underground. In 1942 the foregoing figure was 30.3 tons, which represents an increase of 12 per cent annually.

It is apparent currently to mining executives that the future of the anthracite industry will involve the solution of a pumping problem costing around 100 million dollars. An investment of that magnitude will probably be beyond industry funds, and federal, state, community, and industry participation will no doubt be necessary.

Flash floods, which so seriously affect colliery operations, are being handled by high-speed, stand-by pumps with large capacities since



Automatic pumping plant with two 10-inch 6-stage centrifugal pumps, each 3,000 g.p.m. capacity against 720-foot head—motors 700 h.p., 1200 r.p.m.

flash flood water is not very acidulous, high-speed pumps designed for a head of around 300 ft. per stage are being used. Pumps for that service are built with capacities between 5,000 and 6,000 g.p.m. against heads between 550 and 600 ft. They will be equipped with 1,000 hp. motors; and at the moment, pumping units of the foregoing size seem to be the largest that are practical for underground installations.

The design of these flash flood pumps show two stages, a double suction with the second stage in the center. The two single suction impellers, each with one-half the capacity of the center impeller, are mounted on each side of the center impeller and they discharge into it. A design of this type puts both packing boxes under inlet pressure and packing box trouble common in large pumps with high speeds is avoided.

Dewatering a mine flooded to extinguish a mine fire was a pumping project handled by the Philadelphia and Reading Coal and Iron Company, Pottsville. A fire started in the Knickerbocker mine in 1944, and after all direct methods of extinguishment proved ineffective, it was flooded. The current year witnessed the flooded mine dewatered and several hundred men back on their jobs.

Stream Pollution

Since the passage of the Brunner Pure Streams bill, thousands of plans have been submitted to the State Sanitary Water Board concerning methods proposed to prevent silt from polluting streams.

Some companies have already put into operation projects that will prevent stream pollution. Eagle Hill Coal Company built an efficient sedimentation basin. St. Clair Coal Company constructed a long wooden settling tank in which a slow moving conveyor transports the settled material to cleaning equipment where the No. 5 buckwheat will be reclaimed as a marketable product. Thus the investment in equipment to prevent stream pollution will be offset by an income from coal which previously was lost. The oil flotation plant of the Lehigh Coal and Navigation Company has developed a market for a size which hitherto found its way into streams. And the briquetting plants of the Philadelphia and Reading Coal and Iron Company will utilize a product now being pumped to sedimentation basins.

Stripping

Strip coal mining continued its upward trend in 1945 for several important reasons, among which were: greater production per man as compared with underground mining; lower production costs; the procuring of tonnage more quickly than from a deep mine development; and the availability of larger shovels which make it possible to restrip areas that were proved to be unprofitable with the lighter equipment available 15 years ago.

On account of the geological conditions in the Lehigh and Schuylkill areas being more favorable to strip mining, the stripping tonnage from them shows a remarkable increase. In 1920 when stripping coal was 2.5 per cent of the industry's fresh-mined output, only 0.6 per cent of the Wyoming region's fresh-mined coal came from strippings. Comparable figures from the Lehigh and Schuylkill areas were 9.4 per cent and 2.6 per cent respectively. In 1943 when stripping production was 17.4 per cent of the industry's fresh-mined output, 5 per cent of the fresh-mined coal in the Wyoming region came from strippings, while in the Lehigh and Schuylkill areas the comparable figures were 23.3 per cent and 35.3 per cent respectively.

Economic reasons have contributed largely to the increase in stripping tonnage from the Southern Field. Here, generally speaking, much coal produced in deep mines is mined at a loss; hence stripping coal with its lower cost offsets a high inside mining cost.

The relative growth in stripping tonnage in 30 years is shown in Table III.

TABLE III
STRIPPING TONNAGE

Year	Total Tons	Per Cent of Fresh-mined
1915	1,122,000	1.3
1920	2,054,000	2.5
1925	1,578,000	2.7
1930	2,536,000	3.7
1940	6,353,000	13.3
1941	7,316,000	14.3
1942	9,071,000	16.7
1943	8,989,000	17.4
1944	10,939,000	20.8

Contractors with stripping projects involving the moving of several million yards of material now have organizations capable of high grade engineering, and cost accounting. Amortization of shovel and equipment investments, transportation and loading costs, blasting costs, and overburden ratios all require careful analyses before a project can be placed in the profit-making class. Well equipped repair shops, and well appointed managerial offices at stripping sites impress one of the permanence of the stripping industry. Temporary plants are things of the past.

Many current stripping operations are in areas which were stripped several years ago, deeper cuts, greater overburden ratios were then not possible on account of the lack of excavating equipment of the proper design. Areas of this description require thorough prospecting by test boreholes before intelligent contract negotiations are possible.

The Beechwood stripping of the Philadelphia and Reading Coal and Iron Company forefronts the stripping projects of 1945. Here a 1150-B 25-yd. Bucyrus-Erie walking dragline with a 180-ft. boom is the important piece of equipment on a difficult rock excavating job involving around 11 million yds. of material. (*Mining Congress Journal*, December, 1945.)

An idea of the future of anthracite strippings may be obtained from a stripping now being planned by the Philadelphia and Reading Coal and Iron Company which will be located between the towns of Shenandoah and Mahanoy City. Estimates indicate the moving of 100 million yd. of material, and 45 yd. shovels will be part of the equipment required to do the job.

Mechanical Mining

Even though purchases were restricted, approximately 250 units of mechanical loading equipment of various types were placed in operation with shaker conveyors heading the list. In 1945 there will, no doubt, be an increase in the mechanically loaded tonnage over that of 1944, when it was 36 per cent of the total underground production. Loading coal by machinery in the anthracite mining area is more applicable in the flat seams of the Wyoming region where in 1944 there was mechanically loaded five times more coal than that loaded in the two other regions combined.

Table IV shows growth in the tonnage mechanically loaded since 1940.

A trend of importance has been the placing of duckbills on many shaker conveyors already in operation for the purpose of eliminating the work of shoveling coal. In mines where the coal lies in heavy dips, shaker conveyors have been applied to mining basin coal, local flat areas, and in counters. About 50 per cent of the newly installed shaker conveyors installed during the year were equipped with the compressed air drive, the remainder were operated by electric motors.

TABLE IV
UNDERGROUND MECHANICALLY LOADED COAL

Year	Underground Mechanically Loaded Tonnage (Net Tons)
1940	12,326,000
1941	13,442,000
1942	14,741,000
1943	14,746,000
1944	14,975,000

Around six belt conveyors, 1,500-ft. centers, were placed in underground mining projects when their use eliminated the blasting of rock required to make a gangway of sufficient size to allow the passage of a mine car.

Combinations of belt conveyors, shaker conveyors and chain conveyors make possible the mining of much thin coal which, during the past, was not economically possible. The Ross mining project in the Westmoreland Colliery of the Lehigh Valley Coal Company involves a successful combination of belts and shaker conveyors. Here the Top Ross, 24 to 40 in. thick, is breast mined with shaker conveyors which deliver the coal to a belt discharging in the Bottom Ross where are located the haulage roads. The interval between the two seams of coal is between 15 and 20 ft. Currently about 45 per cent of the colliery's output comes from their coal mining operations.

A combination of scraper loaders and shaker conveyors is used in the Loree Colliery of the Hudson Coal Company, which was reopened in 1941 after being idle for a period of ten years. Shaker conveyors, with angle chutes, are used in second mining, and scraper loaders mine solid blocks of coal.

Loading machines with large capacities, such as are used extensively for loading bituminous coal, have not been successfully applied in anthracite mining, because the mining conditions here preclude their use. But Conway loaders are being gradually introduced in rock tunnels, sectional rock tunnels, and rock gangways. Remarkable records have been obtained in mucking tunnels; a machine will, in 2½ hours, load the blasted rock of an 8 ft. cut in a 12 by 8 ft. tunnel.

The year's purchase of haulage locomotives indicates a trend to permissible battery locomotives. An item of unusual interest is the installation of two 1½-ton battery locomotives in a small mine, many of which were developed during the war by small groups of independent miners. The tonnage from these mines may be around 100 to 200 tons daily. Improvements in storage batteries are forecasted. Their capacity and life are to be increased 30 per cent on account of the use of glass tape, and more durable plate separators.

Refuse Disposal

At many collieries, especially those in the Southern Field, the disposal of breaker refuse is expensive because there is only a limited area at the colliery on which it can be deposited. Narrow valleys, hillside breaker locations, and the existing refuse banks complicate further the economical disposition of refuse. Electric lorry cars, belt conveyors, auto trucks, flight conveyors, and steam locomotives are all used with varying degrees of satisfaction.

During the year, the Philadelphia and Reading Coal and Iron Company placed in service, at its Oak Hill Colliery, a refuse disposal system which included a train of the Differential Steel Car Company's cars. The train contained a 20-ton control car, two 25-ton trailer cars, and a 20-ton three-way dump trailer. To reach the dump site, it was necessary to construct 2,000 ft. of track of which 1,400 ft. was on a 10 per cent grade, and 600 ft. on an 8 per cent grade. Direct current at 575 volts will operate the motors. It will be generated by a 750 kw. stationary mining type sealed ignition mercury arc rectifier. Much interest has been shown in this installation, since the ignitron is believed to be the first installed in the anthracite region.

At the Glen Lyon Colliery of the Susquehanna Collieries Company, breaker refuse is removed by electric lorries which were wired for dynamic braking subsequent to their purchase. After dynamic braking was in service for a period of six weeks, the records showed that brake shoe replacements dropped from 27 to 2 a month.

Colliery Maintenance

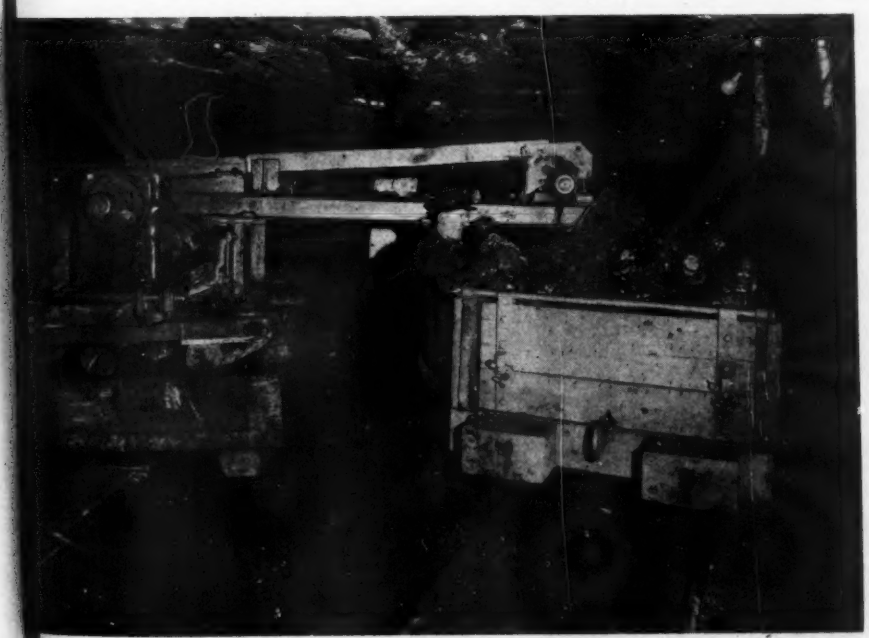
The maintenance of breaker machinery and other mechanical and electrical equipment keeps in step with the forward moves of the industry; and this is as it should be, because production, now more than ever, depends upon the continuous operation of machinery. Initial equipment design is being considered from the cost of maintenance viewpoint. Some collieries have set up simple schedules of inspection and renewal dates of machinery. This plan makes it possible to obtain service records from machine parts made of various steels and their alloys.

Since much of the modern coal cleaning equipment is made from steel, the prevention of corrosion by acidulous breaker water becomes of great importance. Acid neutralizing plants are a prerequisite for low breaker maintenance costs. Lime is used as the neutralizing agent, and the water is treated so that the pH is kept up to approximately eight. To minimize the cutting effect of sand and silt carried by water used in breakers, stainless steel, glass, and rubber are used successfully. Rubber pipe and rubber pinch valves have made remarkable records in reducing maintenance costs in many breakers.

Breaker repairmen now work in accordance with work orders issued by the repair foreman. These orders name the equipment to be repaired and outline the work to be done. Experienced mechanics as night breaker repair bosses pay in the long run.

Lubrication has become a study of the operating organization, and the lubrication engineer who determines the proper lubricant for each bearing. High-pressure grease guns and piped lubricating systems are replacing the hand oil can. Oilers are being impressed with these two ideas; cool bearings and a minimum consumption of lubricants.

Colliery repair shops in which mine cars are repaired have adopted shop methods that compare favorably with



Gathering conveyors eliminate much costly gangway driving—this one is 1,500 ft. long

those used in plants specializing in mass production of machine parts. The repair shops of the Hudson Coal Company are outstanding examples of how modernization helps to reduce costs. In one of these shops, 5,800 wooden mine cars are repaired and kept in good running condition. Each car is numbered to permit keeping accurate maintenance cost records.

Research

The Primos laboratory of Anthracite Industries, Inc., forefronted the research activities of the industry when it developed the anthratube method of burning anthracite in 1944. By the end of 1945, there will have been installed 150 boiler-burners involving the anthratube principle in homes for testing purposes under actual working conditions.

Progress is being made at Lehigh University in research concerning roof testing which is sponsored by Anthracite Industries, Inc., and the General Reinsurance Corporation. The problem is to develop an electronic device capable of picking up the vibrations caused by a blow on the roof from a testing tool. By amplifying these vibrations, it is possible for the tester to determine whether or not the mine roof is solid or loose. The studies are being verified by actual underground tests in the mines of the Lehigh Valley Coal Company, Wilkes-Barre.

Processed Authracite

The Blaw-Knox Company completed a plant in the Philadelphia area to manufacture a packaged fuel consisting of a blend of 80 per cent anthracite fines, and 20 per cent bituminous compressed into cubes with an asphatic binder. The cubes are wrapped in packages, 267 to a ton. Gimbels Department Store advertised that they would sell the fuel as the "White Glove Packaged Fuel."

Two briquet making plants were built by Day and Zimmerman, Inc., of Philadelphia, for the Reading Briquet Company, a subsidiary of the Philadelphia and Reading Coal and Iron Company. Federal funds helped to finance the plants; one of which was built at the Saint Nicholas breaker and the other at the Locust Summit breaker. They are planned to salvage anthracite fines which may prove difficult to sell during the postwar period. Each plant will have a capacity of 1,000 tons daily.

Plans have been announced by the Lehigh Coal and Navigation Company, Inc., for the construction of a new light-weight concrete aggregate plant to cost around $700,000. The product, known as Lehigh aggregate, will be produced by utilizing the carbonaceous shale in the refuse produced in their breakers. Experimentation and research have been conducted for a time in a pilot plant. One of the uses of this aggregate is the construction of concrete floors where lightness is a factor.

Bootleg Activity

A survey of the anthracite bootleg industry, the seventh to be made, shows a continued decline. It is currently 16.7 per cent or one-sixth of its magnitude of March, 1941. Several companies listed in the survey have no active holes on their properties.

The survey indicates that the larger holes cannot be considered as illegal mining, because the land is leased from the landowner. These operations are so extensive that the owners are investing in storage battery haulage locomotives.

Table V gives a four-year summary of bootlegging.

TABLE V

Date	Number of Holes	Number of Bootleggers	Per Cent of March 31, 1941
3-31-41	3,006	10,762	100.0
5- 1-42	2,029	7,554	67.5
12-15-42	1,363	4,967	45.3
4-20-43	1,065	3,607	35.4
11-14-43	791	2,725	26.3
3-31-44	652	2,220	21.7
3- 7-45	502	1,806	16.7

Safety

The production per fatal accident constitutes an accepted yardstick to measure safety in mines, and the anthracite industry's safety progress may be appraised from Table VI.

TABLE VI

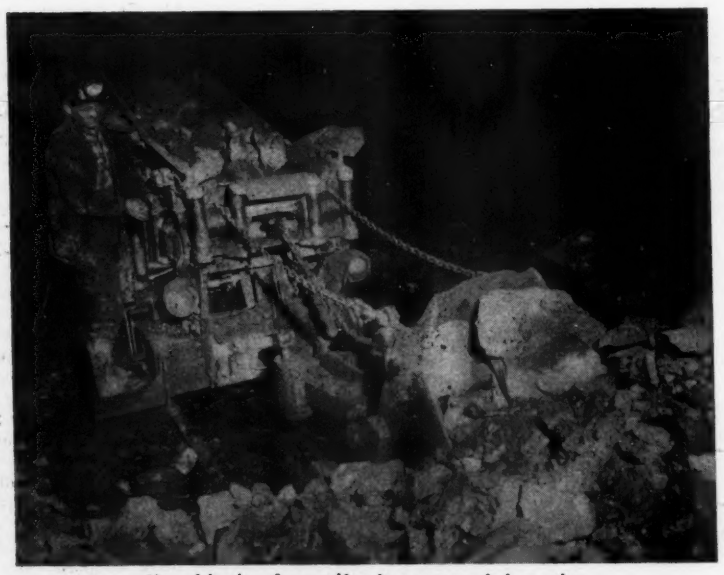
PRODUCTION PER FATAL ACCIDENT

Year	Tons
1940	283,112
1941	285,408
1942	257,509
1943	277,577
1944	374,927
1945 (to October 31)	386,432

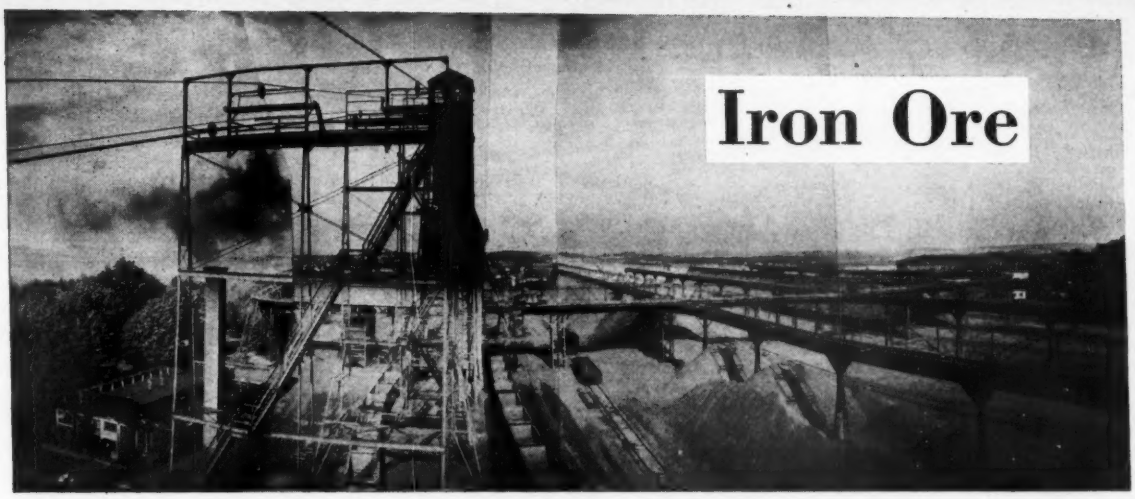
On the exposure basis, the fatality rate per million man hours of exposure was 1.04 for 1944. The 1943 rate was 1.50 and the previous low was 1.49 in 1941. The trend of anthracite fatalities on an exposure basis has been irregular since 1911, but since 1940 it has been fairly stable at the 1.50 level.

Conclusion

As the industry advances into the postwar period many important problems will require a solution based upon sound business principles. The industry, labor and coal consuming public, all have a future at stake, and that future can be kept bright only through a wholesome cooperation of the interested parties.



Use of loaders for mucking in gangways is increasing



Iron Ore

This extensive steel trestle layout helped make it possible for the Montreal mine to ship an average 1,104,567 tons per year for the 5-year period, 1941-1945, inclusive

Iron Mining Registers Progress in Facilities, Operating Methods and Equipment

By VERNE D. JOHNSTON
Mining Engineer
Oglebay Norton & Co.

SHIPMENTS of iron ore from mines in the United States in 1945 totaled 89.0 million gross tons compared to approximately 96 million gross tons in 1944, 100 million gross tons in 1943, and nearly 107 million gross tons in 1942, the record year. Table I shows the minimum shipments by producing districts in the United States for the past four years. It is to be noted that there has been a gradual small increase in eastern and western production and an accompanying decline in the output of the Lake Superior and southern districts during this period.

The Lake Superior District

In 1945 the mines of the Lake Superior district in the United States shipped 74,758,091 gross tons by lake and approximately 1,202,000 gross tons all-rail. Lake shipments from mines in the Province of Ontario, partly for United States consumption, were 956,659 gross tons. Table II shows the 1945 mine shipments of the Lake Superior district by Ranges in the United States and the total from Ontario.

The 1945 season of navigation was officially opened by the passage of an up-bound vessel through the Soo on March 25 and through the Straits of Mackinac on March 30. The ports of Escanaba and Ashland began loading ore on April 2, Two Harbors on April 3, and Duluth-Superior on April 4. These loadings were three to six days earlier than in 1944 and the shipments for the month of April amounted to 7,282,074 gross tons, exceeded only by April, 1942, in which 8,649,708 gross tons were shipped for an all-time April record. Ice and fog conditions were better than average permitting this early opening of navigation. In future years the needed early openings of navigation will undoubtedly be materially assisted by the Coast Guard's new $10,000,000 ice-breaker, *Mackinaw*, which is the most powerful ice-breaker in the world. The final 1945 cargoes were loaded at Su-

TABLE I—U. S. IRON ORE SHIPMENTS* BY PRODUCING DISTRICTS†

District	1942 Gross Tons (Millions)	1942 Per Cent of Total	1943 Gross Tons (Millions)	1943 Per Cent of Total	1944 Gross Tons (Millions)	1944 Per Cent of Total	1945‡ Gross Tons (Millions)	1945‡ Per Cent of Total
LAKE SUPERIOR								
Minnesota, Michigan and Wisconsin....	93.01	87.10	85.98	85.85	81.86	25.52	86.0	85.4
SOUTHERN								
Alabama (including Georgia, Virginia, Texas and Missouri).....	9.21	8.63	8.53	8.52	7.40	7.73	6.6	7.4
EASTERN								
New York, Pennsylvania and New Jersey	3.08	2.88	3.19	3.18	3.50	3.66	3.4	3.9
WESTERN								
Wyoming, Utah, California, New Mexico	1.48	1.39	2.45	2.45	2.96	3.09	2.9	3.3
Total.....	106.78	100.00	100.15	100.00	95.72	100.00	89.0	100.00

* Exclusive of by-product pyrite cinder and sinter from various sources.
† Sources: U. S. Bureau of Mines, Lake Superior Iron Ore Association, and others.
‡ Figures not final.

TABLE II—LAKE SUPERIOR IRON ORE SHIPMENTS
1941 to 1945, Inclusive
(From Lake Superior Iron Ore Association Records)

U. S. Ranges	1941	1942	1943	1944	1945*	Total 1942-1945 Inclusive
Gogebic	6,301,379	6,237,894	5,486,918	5,604,354	4,310,400	27,940,945
Marquette	6,254,391	6,540,731	5,601,418	4,790,177	4,531,000	27,717,717
Menominee	4,131,363	4,930,434	4,902,556	4,876,210	4,295,600	23,136,163
Total Michigan and Wisconsin	16,687,133	17,709,059	15,990,892	15,270,741	13,137,000	78,794,825
Cuyuna†	2,441,089	3,094,703	3,285,982	2,538,492	2,363,000	13,723,266
Mesabi	59,772,543	70,280,087	64,906,280	62,509,212	59,065,100	316,533,222
Vermillion	1,847,094	1,924,877	1,779,014	1,538,560	1,395,600	8,485,145
Total Minnesota	64,060,726	75,299,667	69,971,276	66,586,264	62,823,700	338,741,633
TOTAL U. S. RANGES	80,747,859	93,008,726	85,962,168	81,857,005	75,960,700	417,536,458
Ontario, Canada‡	462,747	486,666	450,973	498,635	986,700	2,885,721
GRAND TOTAL LAKE SUPERIOR	81,210,606	93,495,392	86,413,141	82,355,640	76,947,400	420,422,179

* Approximate on account of lack of exact all-rail shipment records.
† Includes shipments from Fillmore Company, Minnesota, 47 tons in 1941, 59,171 tons in 1942, and 220,447 tons in 1943.
‡ Michipicoten and Steep Rock.

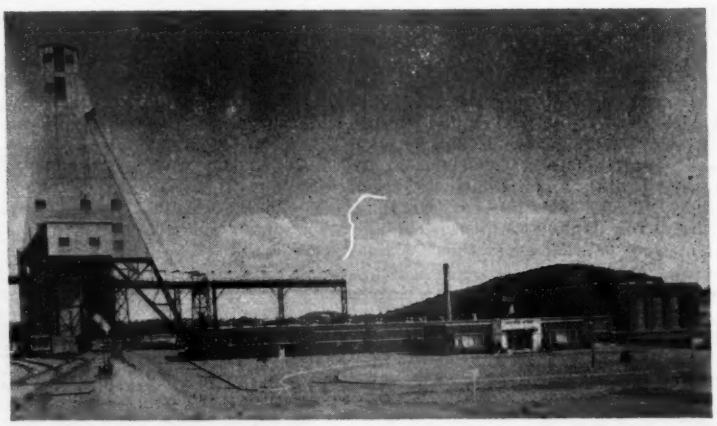
perior and Escanaba docks December 5.

The year 1945 marked the completion of the new Port Arthur dock, which is capable of handling 2,000,000 gross tons of ore annually, but its construction provides for future expansion if necessary. This dock has 100 pockets which is storage for 3,000 gross tons. It's estimated maximum time to load a 10,000-ton boat is five hours. In 1945, due to incomplete construction, it was able to load only 137,982 tons of ore from the Steep Rock mine.

At the beginning of the year, the War Production Board expressed concern about a possible shortage of iron ore developing at the furnaces which would be brought about by a late opening of navigation and labor shortage on lake vessels and at the mines. However, the early opening of navigation and the lessening of estimated requirements brought about by V-E Day and V-J Day made it possible to deliver all the required tonnage and at the same time make a new all-time record for the movement of grain. The closing of the season was somewhat delayed in order to coordinate the coal movement, which had been seriously cut by strike, with the last ore tonnage. All the foregoing was accomplished with an estimated shortage of about 1,500 men at the mines and without commissioning the 26 over-age vessels which the Government received in exchange for 16 new vessels.

Marquette Range

The Marquette Range in its ninetieth year of lake shipments had 15 active mines employing about 3,250 men. These mines included 11 producing high grade ore in the Ishpeming-Negaunee area, 1 in the Gwinn area and 3 producing siliceous ore from the Palmer area. The producing mines in the Ishpeming-Negaunee area were operated by the Cleveland Cliffs Iron Company, Inland Steel Company and North Range Mining Company. The Cleveland Cliffs Iron Company, Richmond Iron Company (the M. A. Hanna Company, agent) and Volunteer Ore Company (Pickands Mather and Company, agent) each had an operation producing siliceous ore. The Interstate Iron Company (Jones and Laughlin) and the Cleveland Cliffs Iron Company continued their extensive diamond drilling programs where by means of refinement in equipment, close supervision and training of drill crews, better results particularly of core recovery have been obtained, than have ever been previously obtained in diamond drilling in the Lake Superior iron districts. A considerable part of this increased core recovery can be attributed to the use of ball bearing type double tube core barrel and improvement in design of core springs. The Cleveland Cliffs Iron Company, the Interstate Iron Company and the Inland Steel Company joined in having the district mapped by aerial photography. The resulting topographic maps undoubtedly will be invaluable to these companies for future surface lay-outs, etc. During the year the head frame of the Holmes mine was dismantled and scrapped. This marks the suspension of a long period of operations by the Oliver Iron Mining Company on the Marquette Range. The shaft at the Blueberry mine, operated by the North Range Mining Company, was deepened a lift below its former 1,470 ft. depth. A new practice to the Marquette Range, successfully used, consisted of mucking entirely by scraper into a specially built cage operating in the ladderroad compartment.



A modern surface plant for a deep underground operation—Mather mine, Marquette Range

Menominee Range

In 1945, the 69th year of Menominee Range operation, 11 properties were active in the Iron River area, 2 in the Crystal Falls area, and 3 in the Iron Mountain area or Lower Menominee, 2 of the latter being small operations producing siliceous ore. 1945 marks the closing of the last remaining Lower Menominee operation producing high grade ore, namely, the Penn Iron mines (Pickands Mather and Company, agent) at East Vulcan and West Vulcan. This group of mines initiated regular shipments from this Range in 1877 and with the exception of 1932 has shipped every year since. Pickands Mather and Company became associated with this group in 1923.

With the exhaustion of its open pit at the Book mine, operated by the North Range Mining Company, a slope hoisting arrangement was installed, designed to operate two 4-ton skips in balance and serving several underground levels and delivering ore directly into railroad car loading pocket. A small beneficiation plant was also erected and operated at the property.

At the Spies mine, operated by the Cleveland Cliffs Iron Company, diamond drill exploration from surface continued and a new ventilation shaft was opened by sinking from surface and raising from underground. The Sherwood mine, operated by Inland Steel Company, continued successful use of shaker conveyors from stopes to main haulage. Three units were in operation.

The geological study of Iron County, Mich., a joint project of the U. S. Geological Survey and Michigan Geological Survey, continued with Carl E. Dutton in charge. Field parties were active in the Amasa, Crystal Falls-Alpha and Randville areas.

Gogebic Range

In 1945, the 62nd year of continuous regular shipment for the Gogebic Range, four companies — Pickands Mather and Company, Oglebay, Norton and Company, Oliver Iron Mining Company and Republic Steel Corporation—were active at nine mines including the Plymouth mine, an open pit from which no shipments were made on account of an extensive contract stripping operation. About 2,700 men were employed in mining on this Range. In 1916 and 1917, World War I period, the Gogebic Range shipped 8,489,783 tons and 7,979,898 tons, respectively. On account of increased depth and orebody exhaustion, World War II yearly shipments have been nearly two millions tons less, with downward trend from 6,301,379 tons in 1941, to approximately 4,310,400 in 1945.

Diamond drilling of blast holes, a practice in use for several years at the Soudan mine on the Vermilion Range, was tried out at the Anvil-Palms. Its successful usage there was limited to hard ore in narrow orebodies. At the Cary mine of Pickands Mather and Company the stripping of the 5½-ft. shaft bore hole was completed. This new shaft with its completed surface plant of latest design is expected to begin producing sometime in 1946.

This Range has attained the greatest depth of any iron mining district. Bottom levels in the Montreal and Eureka mines (Oglebay, Norton and Company, agent) were being developed at elevations of 3,350 ft. and 3,500 ft., respectively, below shaft collars. Diamond drill holes at both mines were exploring to elevations 500 to 1,000 ft. below bottom levels. During the year even greater depths were being explored by diamond drilling at Pickands Mather and Company's Puritan and Anvil mines. At the extreme east end of the Range, Jones and Laughlin Steel Corporation continued diamond drilling on the Vicar property, applying to this work the technique developed on its Marquette Range exploration.

Cuyuna Range

Five operating companies were active on the Cuyuna Range in 1945. One of the outstanding developments on the Cuyuna Range was the purchase by the M. A. Hanna Company of a substantial interest in the Evergreen Mines Company, resulting in the Hanna Company's assuming the management of Evergreen's Cuyuna Range mines and sinter plant, as well as its Mesabi Range properties. Hanna's Portsmouth operation now includes the Evergreen, Wearne, Healy and Oberg properties. In addition to this operation Hanna operated the Maroco. Pickands Mather and Company shipped from the Mahnomen and Sagamore and in the latter part of the year began dewatering Rabbitt Lake which overlies a large reserve orebody adjacent to the Kennedy mine, exhausted in 1925. Inland continued to operate the Armour No. 1, the only underground operation on the Cuyuna Range. On May 10 a fire in the screening tower of the Evergreen sintering plant interrupted production for about a month.

Rhude Fryberger and Leach shipped for the second year from the Snowshoe mine. The Dates Mining Company, a newcomer on the Range, began shipments from the Pennington property, inactive since 1942.

Mesabi Range

The Mesabi Range in 1945 completed its 54th year of production by shipping approximately 59,065,100 tons, making a total of 316,533,222 tons for 1941-45, inclusive. As shown in Table II, an all time record was established in 1942 by the shipment of 70,280,087 tons and the trend has been downward each year since.

As has been necessary during the

At the Mahnomen mine, on the Cuyuna Range, the excellent paved road has proved its worth by minimum upkeep of trucks and tires

war years, heavy stripping programs were carried on during the winter at nearly every open pit property on the Range. Many properties now have belt conveyors from pit screening and truck pocket installations at the bottom of the pit, transporting the ore either direct to the beneficiation plants or to railroad car bins. In 1945 a new conveyor installation at the Hill-Annex, operated by the Interstate Iron Company (Jones and Laughlin), was made. Interstate also put into operation its new crushing, screening and washing plant at the Columbia mine. A new washing plant was completed and put into operation at the Hanna Company's Wabigon mine. All of Hanna's operations on the Mesabi are now equipped with washing plants.

A new company, called the Inter-Range Company, was formed in 1945 by Duluth and Hibbing interests to operate the Minnewas and Sullivan-Larkin mine near Virginia, and a part of the old Kerr mine near Hibbing. The Minnewas operation is both open pit and underground.

During the year, the North Range Mining Company put down into ledge a large diameter bore hole at the Pokegama mine formerly known as the Jordan Reserve. This property is situated in undrained territory on the shore of Pokegama Lake and on the western end of the Range. This hole has a 42-in. casing through surface material approximately 145 ft. and in ledge, 30-in. in diameter, to a total depth of 270 ft. It served a two-fold purpose, yielding information as to the future drainage problem and the character of the orebody.

The beneficiation research continued to play a prominent part in the Range activities. This research covers both phases of beneficiation, namely, improvement of present gravity concentration processes not involving fine grinding and the making of ore from the "Taconites," both magnetic and non-magnetic, involving fine grinding and concentration of this fine material by some process such as flotation.

Butler Brothers doubled the size of their research laboratory at Cooley. The Oliver Iron Mining Company approached the completion of equipping its large research laboratory at Duluth. Butler Brothers put into operation a new "cone" or "hi-density" plant at the Patrick mine, making the fourth hi-density installation on the west end of the Range. Several washing plants are installing hydrosizers for the treatment of the fines, ordinarily passing untreated into the tailings with hitherto standard treatment processes. At the Patrick mine, the American Cyanamid Company supervised the operation of a pilot flotation plant working on the tailings from the washing plant. Taconite research work continued at the Minnesota Mines Experiment Station in Minneapolis, at Battelle Memorial Institute in Columbus, Ohio, at Pickands Mather and Company's research laboratory in Hibbing, Minn., and elsewhere.

The Iron Range Rehabilitation and Resource Commission which is financed by a part of the Minnesota occupational tax on iron ore has allocated $300,000 for an experimental powdered iron plant on the Mesabi Range. According to unofficial reports a site is being sought on the east end of the Range probably near Aurora, because of the presence in this vicinity of iron carbonate in the iron formation. It is expected this plant will employ about 40 men.

Vermilion Range

Two operating companies, Oliver Iron Mining Company and Pickands Mather and Company, operated four underground mines in 1945 on the Vermilion Range. In its 62nd year of shipments, this Range shipped about 1,395,600 tons and employed about 1,200 men. At Ely, Oliver Iron Mining Company operated the Sibley and Pioneer, the latter having attained a depth of 1,460 ft., deepest operation at Ely. Pickands Mather and Company operated the Zenith at Ely. At Tower the shaft at the Soudan mine, an Oliver operation, was deepened to open the 25th level, at a vertical depth of 2,140 ft.

Southern District (U. S.)

The Southern District as reported in Table I comprises Georgia, Alabama, Virginia, Texas and Missouri. The Birmingham area suffered keenly from the labor shortage. Limonitic or brown ore continued to be shipped in from Georgia, also a small tonnage of brown ore from the North Basin of Texas. It is reported that about 250,000 tons of Lake Superior ore was ordered by Tennessee Coal, Iron and Railroad Company by rail from Chicago and about 100,000 tons of this order was delivered in 1945.

At Birmingham, Sloss-Sheffield late in 1945 put into "tune up" operation a large pilot beneficiation plant at the Ruffner mine. At this plant the lower grade siliceous ores will be roasted and concentrated magnetically, the only operation of this kind now existing in the United States. The new D.P.C. concentrating and sintering plant at Republic Steel Corporation's Spaulding mine was getting nicely started as the year closed.

The new D.P.C. blast furnace at Houston, Texas, initially operated by Sheffield Steel Corporation, was taken over by D.P.C. This furnace operated on Texas brown ores from both the north and south basins, mixed with some Mexican ore from Cerro De Mercado. All operations were suspended in August.

The Ozark Ore Company (M. A. Hanna, agent) at Iron Mountain, Mo., put into operation a new crushing plant and a belt conveyor leading to the mill bin. This hematite concentrate product was shipped to Granite City, Ill.

Eastern District

The Eastern District comprising New York, New Jersey and Pennsylvania, was probably handicapped by labor shortage more than any other district and particularly the New York area at the new operations of Republic Steel Corporation, M. A. Hanna and Jones & Laughlin. The Clifton mine of M. A. Hanna was changed from an open pit operation to wholly underground and diamond drilling was successfully adopted for blast holes.

The Cannon and Peters mines at Ringwood, New Jersey, a D.P.C. project to be operated by Alan Wood Steel Company, failed to get into operation in 1945 as expected. The D.P.C. withdrew its support on the grounds that the enterprise was no longer needed for the war effort. Alan Wood Steel Company continued operating at its Scrub Oak, Washington and McKinley mines. The Mt. Hope mine of Warren Pipe and Foundry Company and the Richard mine of the Richard Ore Company were active in New Jersey, and Bethlehem's Cornwall property in Pennsylvania was operated as usual.

Western District

The Colorado Fuel and Iron Company in 1945 completed the new shaft and head frame at the Sunrise mine. This shaft will be known as the Wright shaft after the late Harry A. Wright, former superintendent of this property. The 1945 shipments from the Sunrise property amounted to 607,116 gross tons. This company also shipped 539,411 gross tons from the Duncan mine near Cedar City, Utah. Total shipment from these two mines in 1945 amounted to 1,146,527 gross tons which compares to 1,137,795 gross tons shipped in 1944.

The Kaiser Company continued full operation, obtaining ore from the Vulcan mine in California and from the Utah Construction Company's operation near Cedar City, Utah.

Import Ore

Canada was the source of the largest iron imports totaling 742,468 gross tons. Of this tonnage the new Steep Rock mine near Atikokan, Ontario, shipped 490,015 tons. A larger tonnage was anticipated from Steep Rock but the operation encountered unexpected difficulties with heavy rainfall and slides of the soft overburden. Here too there was a labor shortage.

About 150,000 tons of iron ore was

imported from Algeria, upwards of 200,000 tons from Chile and 30,000 tons from the Cerro De Mercado mine at Durango, Mexico.

The Bethlehem Steel Company is developing an extensive open pit project at the El Pao mine at San Felix, Venezuela. The ore is direct shipping, high grade hematite and the expected yearly output is reported to be 2,000,000 tons.

Iron Ore Prices

The excellent record of the Lake Superior District as shown in Table II was made at the expense of a terrific drain upon developed ore reserves with exploration and development falling behind. This record was made too in the face of rising labor and supply costs with ceiling prices, except in rare instances, set at the 1941 level. Most underground mines were producing in 1945 at a loss generally conceded to be about 25c per ton. After repeated requests by the industry, supported by voluminous data, OPA announced on the last day of the year an increase in the base price of 10c per ton for Mesabi Range ores and 20c per ton for Old Range ores, retroactive for 1945, but applying only to ores mined for sale.

	Per Gross Ton
Mesabi Non-Bessemer	$4.55
Mesabi Bessemer	4.70
Old Range Non-Bessemer	4.80
Old Range Bessemer	4.95
High Phosphorus	4.55

These new ceilings for standard Lake Superior iron ore delivered at Lake Erie and having a natural iron content of 51.5 per cent are:

Copper in 1945

High Peacetime Demands for Copper are Forecast—1945 Output Maintained at High Level Despite Manpower Shortages

★

By

F. H. HAYES

Director

Metals and Minerals Division

Civilian Production Administration

and

D. L. FORRESTER

Chief, Copper Branch

Metals and Minerals Division

Civilian Production Administration

★

THE year 1945 began with the largest military demand for copper of the war period and ended with the largest peacetime demand on record. In the meantime Germany surrendered in May, Japan was defeated in August and reconversion to peacetime economy proceeded at a faster rate than anticipated. The Controlled Materials Plan so far as copper was concerned was abolished on September 30, 1945, and at the end of the year the Government regulations remaining were restrictions on working inventories in order to prevent unequal distribution of supply, the Premium Price Plan for Copper, Lead and Zinc which continues subsidies on domestic mine production until June 30, 1946, under Public Law 88, 79th Congress, and Office of Price Administration controls.

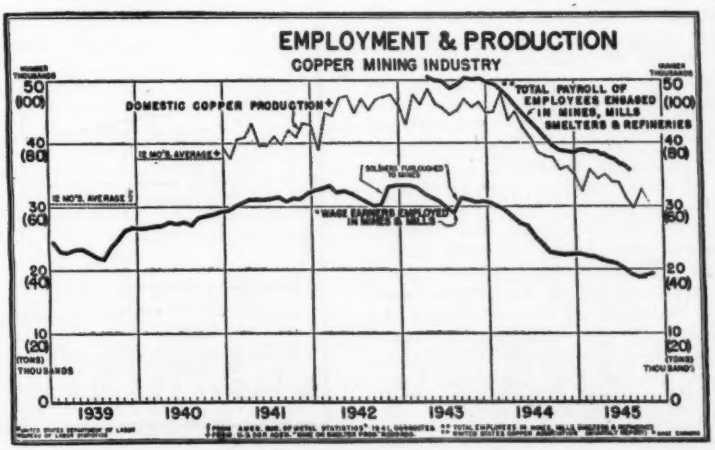
Total refined copper production available to U. S. in 1945 exclusive of stockpile is estimated to be 1,649,200 tons which is a decrease of 8½ per cent from 1944. That the decrease was not greater was due to a higher rate of imports for the second successive year. In other words, domestic production declined 23 per cent while imports increased almost 15 per cent as compared with 1944. The domestic production rate is still slightly better than for the year 1939 despite the fact that the level of employment in mines and mills was lower in 1945 than in 1939. The tabulations shown give comparable figures on employment and production for various periods and demonstrate that manpower losses are entirely responsible for decreased production.

Domestic Primary Production

Operating conditions in 1945 were even worse than in 1944 because of further decreases in the working forces. During the first nine months, the net loss of manpower was 3,400 employes in the mines and the mills.

The mines and mills had been pretty well stripped in 1944 of men in the age group 18 through 25 and early in 1945 plans were made by the armed services to dip deeper into the manpower barrel. However, after the first quarter of the year these plans were modified as the war situation in Europe changed for the better. There were some men lost to other industries but not as many as in 1944.

Steps taken to obtain replacements were the same as in 1944. These included employment of women for surface jobs, inter-regional and intra-regional recruitment, the results of which were discouraging, and the importation of Puerto Ricans and Jamaicans for two of the large open pit mines. However, the hiring of these people was of a temporary nature as the length of the contracts was limited. In spite of the large number of men released from the shipyards and other war industries, the mines continued to lose men.



As a consequence of the loss of men, mine production decreased until the low of September, 1945, was some 36,000 tons below that of March, 1944. For the corresponding months the loss in employment was 10,500 from the mines and mills. Reference is again made to the employment production chart shown below which indicates clearly the relationship between labor supply and production.

As was predicted, the 1945 refined copper production was approximately the same as mine or smelter production as shown in the following tabulation:

DOMESTIC PRODUCTION—1945

	Refined basis	Mine or smelter basis
First quarter	212,700	215,700
Second quarter	233,700	220,000
Third quarter	185,900	203,800
Fourth quarter, est.	209,000	203,600
Total.....	841,300	843,100

(Figures include secondaries to primary smelters.)

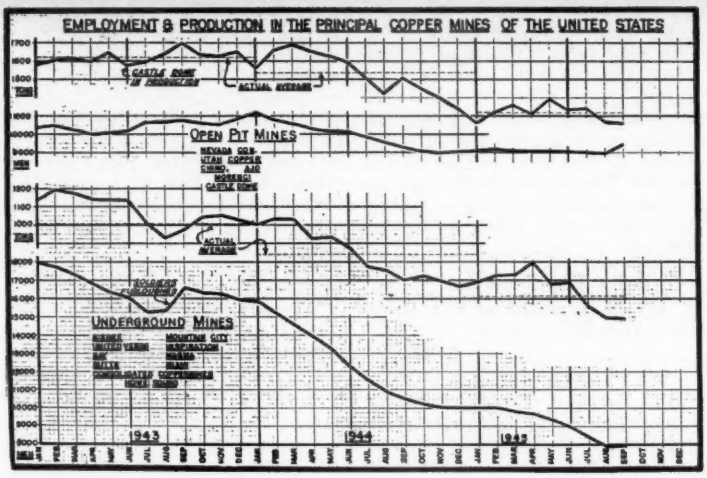
The proportion of the domestic production from open pit mines again increased over the preceding year, being 60 per cent in 1945 against 57 per cent in 1944.

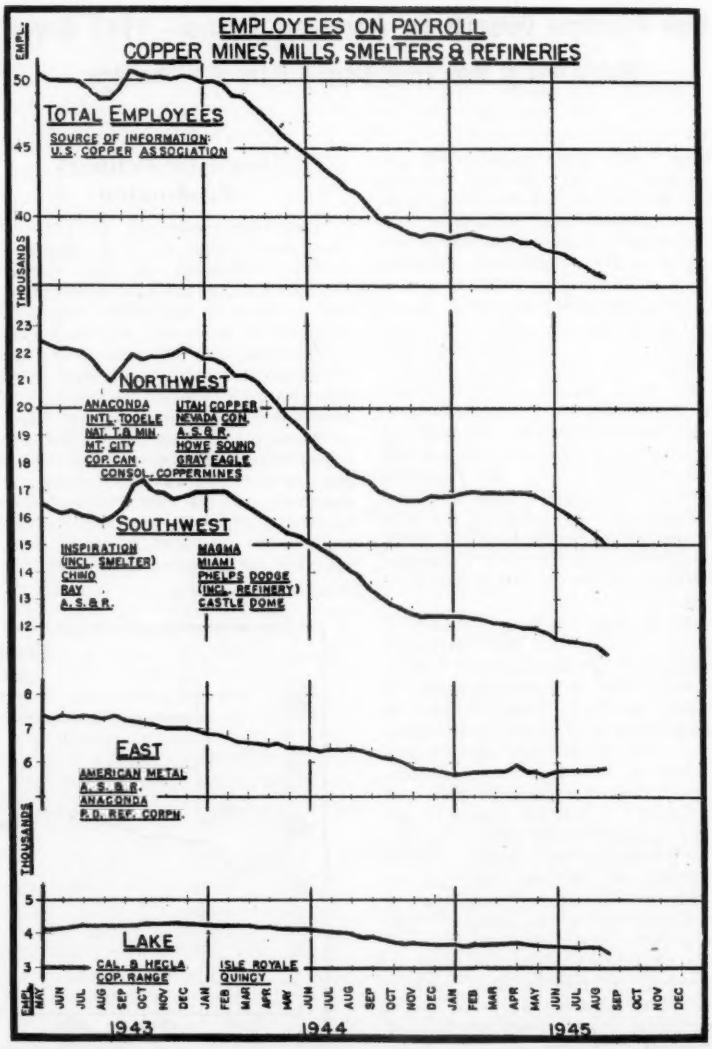
As was the case in previous war years, development and maintenance work in the mines and plants were neglected in an effort to maintain production rates with decreasing labor supply. This policy has now been followed for four years and it will take sometime even with an adequate labor force to correct the development deficiencies.

No new projects for production were initiated during the year and again manpower shortages made it impossible to take full advantage of increased facilities which were made available in previous years.

Premium Price Plan

The Premium Price Plan for Copper, Lead and Zinc was extended by Act of Congress (Public Law 88, 79th Congress) until June 30, 1946 on the same terms as heretofore except that all classes of premiums were made noncancellable unless necessary to make individual adjustments for specific mines. This action by Congress made the extension of the plan mandatory regardless of the war. A number of quota revisions were necessary during the year because of changes in costs, which changes in many cases occurred because of decreased labor forces. The percentage of production on which premium payments were made was 27.8 per cent as compared with 25.1 per cent in 1944. The tabulation shown below gives comparable figures for the Premium Price Plan for 1945 as compared with preceding years.





A small production in 1945 as in the two previous years came from domestic mines working under Reconstruction Finance Corporation contracts. These were very high cost producers and the contracts were not renewed when they expired the latter part of 1945. As a result, two of the properties were forced to suspend operations.

Foreign Primary Production

Foreign copper available to the United States came mostly from the western hemisphere as in previous years. However, due to the lowered rate of production in domestic mines and increased military requirements early in the year, it was necessary to purchase some foreign copper from Africa and Canada for the first half of 1945. These purchases from Africa and Canada were made possible because the United Kingdom reduced their requirements and made these sources of copper available to the United States. As a consequence, imports again increased over the preceding year even though all contracts for foreign copper where possible were canceled as of October 31, 1945. The availability as refined copper of foreign purchases of ores, concentrates and blister purchased in September and October will continue during the early part of 1946.

As in previous years, Chile furnished the major part of foreign production followed in order by Canada, Mexico, Peru, Belgian Congo, Rhodesia, Libya, Cuba, Ecuador and New Foundland. The imports and total supply of refined copper during the last four years is shown in the accompanying tabulation.

Scrap Copper

Supply and consumption of copper scrap were again practically in balance in 1945. Shortages in labor, gasoline and tires made it difficult to collect old scrap. Fired cartridge cases from target ranges in this country and from European battlefields were used as fast as manpower and facilities could handle them. For the year approximately 42 per cent of the copper used by brass mills, copper wire mills, brass or bronze foundries and other processors came from secondary sources.

Copper Stockpile

The Reconstruction Finance Corporation stockpile of refined copper increased approximately 100,000 tons during the year and the total at the end of the year is estimated to be approximately 450,000 tons. Under the regulations of the Surplus Property Act of 1944, provision is made to allow the use of some portion of this stockpile to meet deficits in current production. In other words, should reconversion needs for refined copper for a six months' period exceed the current production from private sources, the deficit can be made up by withdrawals from the Reconstruction Finance Corporation stockpile and the Surplus Property Act provides that the estimated amount to meet such deficits will be withheld from transfer to the postwar stockpile.

DOMESTIC MINE PRIMARY COPPER PRODUCTION
(Short tons of copper)

	Est. 1945	1944	1943	1942
Open pit mines	474,800	560,739	591,747	545,414
Underground mines	318,300	430,418	512,603	543,175
Total	793,100	991,157	1,104,350	1,088,589

Production from open pit mines has increased from 50 per cent in 1942 to 59.9 per cent, estimated, in 1945.

Decreases in 1945 Production from 1944:

Open pits 15.33 per cent with a labor loss at August 15 of 2.27 per cent of employes on January 1.

Underground 26.05 per cent with a labor loss at August 15 of 9.65 per cent of employes on January 1.

PREMIUM PRICE PLAN

	Est. 1945	1944	1943	1942
Production on which no premiums are paid	572,600	738,584	841,974	982,206
Production on which premiums are paid	210,400	220,650	231,385	103,068
Production under RFC contracts	10,100	31,923	30,991	3,315

LABOR STATISTICS, DOMESTIC MINES, MILLS, SMELTERS AND REFINERIES—NUMBER OF EMPLOYES ON PAY ROLL, 1945

District	Jan. 1	Sept. 30	Loss or (Gain) Total	Pct.
East	5,676	5,716	(40)	(0.71)
Lake	3,718	2,310	1,408	3.8
Northwest	16,574	14,329	2,425	14.5
Southwest	12,372	10,785	1,587	12.8
Total	38,520	33,140	5,380	14.0
Furloughed soldiers included in above	(1,333)	290	1,043	78.2
Domestic Mine Production: Tons of copper	69,762	59,160	10,600	15.2

SUPPLY OF REFINED COPPER
(Short tons)

	Est. 1945	1944	1943	1942
Domestic:				
Refined from ores	787,900	1,033,800	1,116,500	1,072,000
Refined from scrap	53,400	65,341	90,000	70,000
Total domestic	841,300	1,099,100	1,206,500	1,142,000
Foreign imports	807,900	704,800	620,600	655,700
Grand total	1,649,200	1,803,900	1,827,100	1,797,700

Forecast for 1946

Indications are that peacetime demands for copper will be at an unprecedentedly high rate, so much so that maximum production from existing facilities with adequate manpower will not be able to meet the demand. This need for copper, of course, is predicated on a high level of business activity with no work stoppages in other industries. This need for a high rate of production may well last several years beyond 1946.

Loading with St. Joe shovel, Federal No. 12 mine

LEAD—

★

By

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and

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Domestic Mine Production Declines Due to Labor Shortages. Refined Lead Consumed at Near Record Levels

DESPITE huge reductions in military requirements immediately following victory in both the European and Pacific phases of the war, the supply of lead available for industrial consumption throughout 1945 was seriously short of the demand. Domestic mine production, the largest single source of supply, continued to decline. Imports of lead-bearing materials so urgently needed to offset the decreasing domestic mine output dropped to a new low since 1940. Smelter production of secondary lead, always a substantial source of the heavy metal, increased moderately over the 1944 output and provided a cheerful note to an otherwise depressing picture of new supplies for the lead industry. Consumption of refined lead continued at a near-record level, and to meet the demands for essential military and civilian use monthly allocations were made from government stocks of refined lead. As a result, the stockpile had been reduced to only 65,000 tons at the end of 1945—considerably less than a month's supply at the average rate of consumption during the year. Throughout most of the war period lead was considered in ample supply, and it was not until late in 1944 that this false sense of security was dispelled. The government stockpile had been reduced from a peak of 273,000 tons in March, 1943, to 90,000 tons at the beginning of 1945.

Mine Output Retarded by Labor Shortages and Scarcity of Ore

New supplies of lead for industry come from three sources: Domestic mine production, imports and secondary smelter production from scrap material. The 1945 output of recoverable lead from domestic mines, based on preliminary data for 10 months was 375,000 short tons, a decrease of 10 per cent from the 416,861 short tons produced in 1944 and the smallest output since 1938. Domestic mine production has been dropping steadily since the war-period peak attained in 1942. Since that year there has been a steady decline in the labor available to the mining industry. Many operators reported the labor shortage during the latter months of 1945 more critical than that experienced at any time during the war. Equally as effective in retarding mine output was the general scarcity of developed ore. Generally speaking, the industry could not

MINE PRODUCTION OF RECOVERABLE LEAD, 1945, IN SHORT TONS

	Eastern States	Central States	Western States [1]	Total United States [1]
January	489	18,142	15,507	34,138
February	386	15,996	14,796	31,178
March	476	17,671	16,652	34,799
April	527	16,241	16,406	33,174
May	434	18,120	16,353	34,916
June	279	15,195	16,053	31,527
July	291	16,129	13,867	30,287
August	274	15,651	14,450	30,375
September	431	15,508	13,591	29,530
October	565	17,321	13,885 [2]	31,771 [2]

[1] Includes small production from Alaska.
[2] Estimated.

* Published by permission of the Director, U. S. Bureau of Mines.

conduct full-scale mining and development simultaneously. Many operators, who during the early war months had moved virtually all their mine labor to production, found it necessary to return, at least in part, to their pre-war practice of maintaining substantial development crews. As these crews had to be recruited from miners on production because of the general labor shortage, the lead output suffered.

Subsidy payments under the Premium Price Plan for over-quota production continued to be paid to lead producers (miners) throughout 1945. The original plan in force since February 1, 1942, was operative only until July 31, 1945. Congress passed the Hayden-McFarland bill, S. 502, on June 14, 1945, extending the time limit of the plan to June 30, 1946. So far wide support has not developed for any program further extending the subsidy system.

The prospect of returning lead output from domestic mines in 1946 to the 1942 level appears remote despite a market that could easily absorb such production. The problem of providing an adequate labor supply for the mines and mills plus the uncertainty as to the price of lead after June 30, 1946, are two of the issues that will tend to limit production in the coming year.

International Supply Situation Tightens

Before the war, United States requirements for refined lead were satisfied, for the most part, from domestic sources. During the past few years, however, the country has come to rely heavily upon imports to bridge the gap between a rapidly rising consumption and a declining domestic output. Imports for 1945, based on 10 months' figures, were approximately 302,000 short tons of contained lead, over half of which came from Mexico. Peru, Australia, and Canada also supplied large quantities. The 1945 imports, lowest since 1940, dropped 6 per cent below 1944 and 39 per cent under the record total for 1942. With the United States dependent upon imports of lead to offset the decreasing mine production, the importance of sustaining the flow of foreign lead into the country is self-evident. The future supply of imports at the end of the year, however, was far from reassuring. The inevitable return of the competitive world market had become a reality. European nations anxious to reestablish their industrial economy and to procure pig lead for reconstruction were actively seeking such material in the countries that were the source of much of our imports during the war period. Thus an already tight international supply situation is being further aggravated by the demands of nations completely impoverished of lead.

Secondary Smelter Lead Shows Slight Increase

Turning to the brighter side of the supply situation, available but incomplete data reveal a moderate increase over 1944 in the production of lead at secondary smelters. This increase is due largely to the efforts of the War Production Board in locating and assisting in the delivery of lead scrap to the secondary smelters. During the war period much lead was consumed in manufacturing materials from which the lead is lost to the secondary market. In 1944, the tonnage utilized for tetraethyl lead, ammunition, pigments, and chemicals and insecticides, all dispersive uses, amounted to over 30 per cent of the total domestic consumption. Moreover, much lead shipped to the battle fronts, though in forms readily recoverable, will not return to the domestic market. Considering the large percentage of nonrecoverable lead that has gone into these items, plus the fact that battery manufacture for civilian use, a large source of secondary material, has been curtailed during the war, the possibility of a continued increase in the production of secondary lead in 1946 appears unlikely.

The high level of lead consumption prevailing during the war period continued through 1945. However, preliminary data indicate the consumption (exclusive of antimonial lead, unrefined lead, and lead in alloys) will probably prove to be less than 1944—perhaps about 698,000 tons. The manufacture of storage batteries, cable covering and tetraethyl lead continued to be large consumers of the heavy metal. The market for new automobiles and the replacement needs for vehicles in current use promise a strong demand for batteries. The immediate prospect of the civilian users obtaining new batteries in 1946, however, is not good in the face of amended Lead Conservation Order M-38 issued December 18, 1945, which reduced the first quarter 1946 quota of lead for automotive-type batteries to 22 per cent of that used during the calendar year 1944. The industry anticipates that 4,200,000 passenger car batteries can be produced from the new quota in 1946 compared with 3,200,000 units produced in the similar period of 1945. It is of interest to note that the uses of the lead storage battery are such that the war-devel-

CONSUMPTION OF REFINED LEAD IN THE UNITED STATES, 1941-44, BY USES, IN SHORT TONS

	1941	1942	1943	1944
Ammunition	32,959	48,025	64,023	31,479
Bearing metals	10,160	8,466	10,189	15,941
Brass and bronze	[1]	5,294	5,748	7,845
Cable covering	141,161	128,535	117,802	110,417
Calking lead	32,380	9,047	8,618	9,411
Casting metals	9,243	3,106	3,072	4,425
Collapsible tubes	3,726	9,966	11,425	12,482
Foil	51,516	9,359	5,816	11,190
Pipe, traps, and bends	32,946	21,411	18,724	24,387
Sheet lead	35,480	31,700	27,738	31,546
Solder	35,630	13,371	15,472	22,390
Storage batteries	73,982	62,604	68,239	68,769
Terne plate	2,069	2,336	815	2,190
Type metals	2,975	943	812	1,269
White lead	83,230	56,476	36,809	54,333
Red lead and litharge	143,496	100,563	124,715	157,080
Tetraethyl lead	48,327	50,152	65,320	83,067
Chemicals and insecticides	8,861	6,298	8,172	10,703
Annealing	[1]	5,229	5,987	5,719
Galvanizing	[1]	484	819	1,073
Lead plating	[1]	[1]	941	494
Weights and ballast	[1]	[1]	9,269	22,964
Other	64,506	33,746	64,940	33,646
Total	812,647	607,111	675,465	722,820

[1] Included under "Other."

oped mercury battery is not competitive at this stage of development.

Sharp Gains Made in Manufacture of Tetraethyl Lead

Perhaps the most striking gain in the use of lead has been in the manufacture of tetraethyl lead for gasoline. The use of lead for this purpose has increased from 48,327 tons in 1941, to 83,067 tons in 1944. The total for 1945 probably will exceed 80,000 tons. The utilization of lead in tempering gasoline is expected to continue as an important use but at a lower level now that military demand has nearly disappeared.

Postwar Uses of Lead

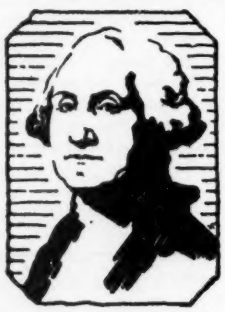
The use of lead in pigments and other compounds in 1945 will continue below normal due to restrictions on consumption. The dormant market in the form of deferred painting maintenance which has developed during the war period provides a bright outlook and a brisk future market for the pigment phase of the lead industry. However, here as in other uses of lead, the beginning of the year 1946 finds this section of the industry confronted by lowered quotas and further restrictions in use.

The use of lead in solders and bearing metals was encouraged during the war period as a means of conserving tin, and judging from the constant increase in quantities used during the past few years, it seems likely that this market will continue.

Although the war stimulated the lead market the use of the metal continued along much the same lines as in former years. The war uses of lead were numerous but not unusual and mostly for products other than munitions. Apparently the war did not develop any important new uses for lead, nor were any substitutes discovered with substantial peacetime possibilities. It seems reasonable therefore that there will be little change in the future uses of lead. Rapid expansion of the use of titanium pigments, already under way before the war, may result in a substantial reduction in the use of lead pigments in the postwar period, a trend that would develop more rapidly if the price ratio of lead to titanium pigments grows more favorable to the latter.

Operation of Government Controls

Lead continued under Government control during 1945 through the provisions of War Production Board General Preference Order M-38. In operation the order prohibited the use of lead for certain purposes and permitted all essential uses to function free of control. Facing a critical supply position late in 1944, the War Production Board amended Order M-38, effective December 26. Under the revised order, the use of lead for most civilian applications was restricted to 60 per cent of the 1944 level of consumption. The order contained three lists pertaining to the restriction and availability of lead: The first group, "A," banned the use of lead in certain civilian items; group "B" covered military uses, storage batteries, cable covering, tetraethyl lead, ammunition, and a few non-military uses such as solders, bearing metals, and brass and bronze, for which lead would be available without restriction; and group "C" which contained the civilian items restricted to 60 per cent of the 1944 consumption. Greater restrictions were placed on other than essential uses in an amendment to the order on January 15, 1945. A second amendment on February 1 increased the allowable use of lead in storage batteries for civilian use from 30 per cent of the 1944 base period to 37.5 per cent. The order was again amended, effective March 31, when a list of 64 permissible uses was substituted for the previous lists A, B, and C, which covered restricted uses, unrestricted uses, and quota percentage restrictions.



1732-1799

To be prepared for war is one of the most effectual means of preserving peace.—*Washington.*

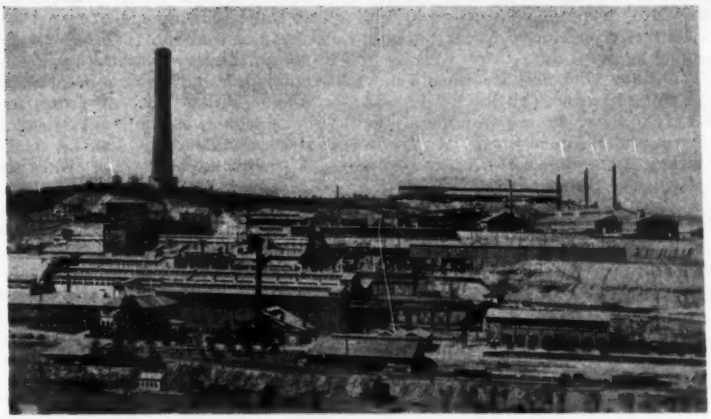
Government control over lead was extended on February 14 to imports of three important manufactured items when War Production Board General Imports Order M-63 was amended banning the importation by private purchasers of collapsible lead tubes, storage batteries, and lead foil. Later in April a subsequent amendment included lead disks, slugs and other semi-fabricated forms in which lead is a component part.

As a result of cut-backs in military requirements lead quotas for several manufactured articles were increased during the summer months. Storage-battery manufacturers were permitted an increase to 25 per cent of the 1944 usage during the third quarter of 1945. A similar increase in quota was permitted in the preparation of collapsible lead tubes. In late July the War Production Board, because of increasing stocks, removed lead from the "Critical Materials" list and placed it on a list of products still under surveillance. Prompted further by the improved statistical position of lead during early August, the War Production Board removed entirely the limitations on the use of lead chemicals for rubber compounding and gasoline refining. The production of white and red lead was permitted a moderate increase.

The optimism concerning improvement in the lead supply situation enjoyed only a brief existence, however. The Government stockpile was rapidly dwindling, and it was obvious that important reserves would soon be dissipated unless consumption was restricted further. Accordingly, on December 18 the Civilian Production Administration (successor November 3 to the War Production Board) announced a reduction in allocations to producers of automobile batteries and tetraethyl lead for the first quarter of 1946. Quotas for the manufacture of industrial-type batteries, cable coverings, and collapsible tubes were unchanged.

1946 Outlook

The lead industry's outlook for 1946 is difficult to appraise. The year begins with demand held in check by Government controls. The average price at which lead is produced is not the same as the price to consumers because of the bonus plan and Government foreign lead purchase contracts. Thus a free enterprise supply-demand-price relationship is nonexistent. It appears certain, however, that, for the immediate future, if controls were removed prices considerably above present averages (including bonus payments) would be required to bring supply and demand into balance. Another factor having an important effect on the present supply situation as far as domestic mines are concerned is the shortage of labor. So far demobilization of the armed forces and the lay-offs at war plants have not resulted in any appreciable flow of miners to the lead mines, according to the operators. The supply of labor will also affect the output of lead from secondary smelters. Many scrap dealers feel that a relief in the manpower shortage will ultimately produce more scrap lead for treatment, although the quantity of scrap that can be acquired economically has declined. Foreign sources of supply are unpredictable for a number of reasons, including labor conditions abroad and the growing competition in international trade. Although Government regulation will be an important and perhaps a controlling factor in the lead situation for 1946, the natural economic forces in the industry indicate a strong market resulting from short supply and broad demand.



Refinery and electrolytic zinc plant—Great Falls, Mont.

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By ERNEST V. GENT
Secretary
American Zinc Institute, Inc.

★

The Zinc Industry

With Fine War Record, the Zinc Industry Looks Forward To Active and Useful Future

IN 1945 slab zinc production in the United States was higher than in prewar times but did not measure up to the annual output in the previous four years. With more manpower and better labor efficiency, the tonnage produced in the past 12 months would have been greater.

Demand as reflected by smelter shipments was good; in fact, deliveries in the first three months broke all records but the year's total—a little better than 1940 shipments—was considerably under 1944 and the peak which was reached in 1943. Exports were insignificant in comparison with the earlier war years. It is interesting to note that consumption figures recorded elsewhere in this review are higher than shipments reported to the Institute. This difference can be explained by the imports and sundry domestic production not included in Institute shipments plus, perhaps, some time lag between the two reports.

The addition to stocks during the year shows that the spread between production and shipments was not as large as in former years.

The Institute's statistics shown in the accompanying tabulations account for all slab zinc production at domestic smelters and refineries with the exception of about 1,000 tons monthly from a few secondary plants. Included in these statistics are all grades of metal produced from domestic and foreign ores and secondary materials. Imported slab zinc is not included. Stocks shown in Column 5 include both producers' and government stocks held at smelters.

Consumption figures begin to show the transfer from war to peacetime uses and to take on the old-time pattern. Galvanizing, which took second place in 1942, again developed as the principal outlet, not quite up to the 1941 peak but apparently headed fast in that direction. If the production of galvanized sheets and other zinc-coated products is able to surmount the many obstacles and reaches the scale necessary to meet the tremendous backlog of civilian requirements, new records in this department of use will easily be established. As was to be expected, a noticeable readjustment is reflected in the reduction of the consumption of zinc in brass, sharply down from the 1943 peak. In the case of zinc base alloys and rolled zinc, consumption materially increased with the removal of restrictions and the advent of the reconversion program.

The Office of Price Administration's price ceilings, with the base fixed at 8.25c per pound for prime western grade f.o.b. E. St. Louis, continue to be effective; but War Production Board controls on slab zinc, which were initiated in April, 1941, went out the window with the withdrawal of conservation restrictions in June and the revocation of allocations in August, deliveries being handled thereafter by the industry in the ordinary course of business.

Metal Production

The Institute reports slab zinc production in 1945 averaging 2,190 tons daily or a total of 799,462 tons. This was an 11 per cent drop from the previous year's total of 901,332 tons. The highest point of production during 1945 was in March, when the daily average ran at 2,314 tons or a total of 71,739 tons.

While the trend was downward in the next six months with a low of 61,600 tons in September, there was an upward spurt in the last quarter of the year. In spite of strikes which shut down operations at two Illinois refineries during the entire month, production in December ran over 66,000 tons. The smelter at Moundsville, W. Va., closed early in July and has remained idle ever since.

Total shipments in 1945 were 777,649 tons, 7 per cent lower than the 837,322 tons in 1944. Stocks at December 31 were 259,333 tons, an addition of only 21,813 tons since the beginning of the year. The bulk of the stocks reported is held by Reconstruction Finance Corporation and intended for permanent stockpile purposes, and consequently should not be considered as available in the ordinary sense.

Consumption promises to be good and it is hoped that, in spite of labor difficulties and increasing costs, a good rate of production will be maintained in 1946 by domestic smelters and refineries which now have available idle capacity. In any event consumers, who have been worried by the headlines which overemphasize threatened shortages of minerals and metals, may take hope, at least in so far as zinc is concerned. Mexican and Canadian slab zinc is entering the United States

currently in substantial quantities (see Imports) and is likely to continue to do so whenever domestic production fails to meet consumption requirements.

Mine Production

Domestic mine production figures for 1945 and previous years are as follows:

RECOVERABLE ZINC
(Tons of 2,000 lbs.)

	1943	1944	1945*
Eastern states	199,233	176,327	156,891
Central states	222,707	214,949	163,323
Western states	322,256	327,366	288,132
Total U. S.	744,196	718,642	608,346

Source: U. S. Bureau of Mines.
* Preliminary—November and December estimated by A. Z. I.

To the above are added the following details with respect to the operations in the Tri-State mining district of Kansas, Missouri and Oklahoma. This district produced 260,000 tons of zinc concentrates for the 52 weeks beginning December 30, 1944, and ending December 29, 1945. The weekly average production amounted to approximately 5,000 tons. This represents a decrease of 95,121 tons or 26.8 per cent under 1944. For the first quarter, production averaged 5,435 tons weekly; for the second quarter, 4,998 tons; for the third quarter, 4,825 tons; and for the fourth quarter, 4,741 tons. The decline in production noted is consistent with the trend in this district since the wartime peak of 1941, as the following figures show.

TRI-STATE CONCENTRATE PRODUCTION
(Including Production from Tailings)
(Tons of 2,000 lbs.)

1941	478,403
1942	443,847
1943	376,236
1944	355,121
1945	260,000

The Joplin concentrate market remained constant at $55.28 * due to the price freeze by OPA. However, premiums continue to be paid by the Office of Metals Reserve for all production in excess of quotas. Manpower shortages still plagued the Tri-State mining industry during the major portion of the year. Definite improvement was seen in the latter part of November, with a slight influx of both experienced and inexperienced men. This trend continued through the end of the year, with general improvement of manpower being noted. Over-all operating cost continued to increase, due primarily to decreased labor efficiency.

* Reduced to $50 on January 4, 1946.

Net reserve stocks remained insignificant throughout the year, as nearly all concentrates produced were sold and shipped as produced.

The labor shortage and inefficiency experienced in the Tri-State field was quite generally true throughout the Central and Western States. As an indication of the difficulties in this connection, the Bureau of Labor Statistics shows that employment at lead and zinc mines, which in 1942 reached a wartime peak of approximately 20,000, was down to 13,700 at mid-November in 1945, having been reduced by 1,300 since the first of the year.

Imports

The following figures are taken from Bureau of the Census and Bureau of Mines sources and relate to total imports, or general imports as they are officially termed. Such imports include entries for immediate consumption and entries into bonded warehouse.

It is obvious from these figures that slab zinc imports are on the increase and that the 1945 total will set a record high point in this respect. Ore imports may not equal the 1944 total but will not be far from it. It will be seen that the peak of ore imports was reached in 1943.

It is difficult to forecast the future with respect to imports, for much depends upon the rate of domestic consumption, labor costs, tariff and stockpiling policies, premium prices and subsidy payments. Smelter subsidies expired on December 31 and ore subsidies are due to expire on June 30, 1946.

Consumption

As reported elsewhere, total shipments from smelters according to Institute figures were 777,649 tons in 1945. Of such tonnage, less than 10,000 tons were credited to exports. However, the consumption figures, shown on the following page, are a much better guide to actual use.

Galvanizing in 1945 resumed its place as the principal outlet for zinc. Given a fair chance, the peak consumption for zinc coatings in 1941 of 350,854 tons will soon be reached and exceeded. The silencing of the war guns is, of course, responsible for the sharp reduction in the tonnage of zinc in brass. We shall probably see some recovery when reconversion, and particularly construction, get further under way. Zinc used in zinc-base alloys is getting back to the higher levels of

I. SLAB ZINC IMPORTS
(Tons of 2,000 lbs.)

FROM	1941	1942	1943	1944	1945*
Australia	.....	.....	2,241	4,480	14,416
Canada	7,236	1,749	8,570	18,099	38,528
Indo China, French	1,653	.....	.....	.....	.....
Mexico	25,621	34,603	45,344	39,703	34,556
Peru	44	.....	.....	.....	.....
Southern Rhodesia	.....	.....	.....	1,344	.....
Total Current Imports	34,554	36,352	56,155	63,626	87,500

* January-November preliminary figures.

II. ZINC ORE IMPORTS (Zinc Content)
(Tons of 2,000 lbs.)

FROM	1941	1942	1943	1944	1945*
Argentina	20,579	23,395	53,452	19,872	.....
Australia	8,933	32,212	120,244	42,216	14,171
Belgian Congo	12,563	2,873	14,835	.....	.....
Bolivia	2,687	5,893	2,760	5,305	5,771
Canada	49,764	78,104	110,343	112,299	84,072
Chile†	2,157	6,872	14,369	2,477	32,477
Mexico	148,201	160,959	166,135	177,629	168,097
Newfoundland and Labrador	7,267	30,550	32,949	19,013	21,579
Peru	28,833	27,506	21,901	43,889	27,811
Spain	8,227	.....	.....	.....	.....
Other countries	2	44	.....	.....	.....
Total Current Imports	289,213	368,408	536,988	422,700	353,978

* January-November preliminary figures.
† Substantially all zinc shown as received from Chile originated in Bolivia.

earlier years. When the automobile industry gets going and other peacetime products add to the demand, the top tonnage of 1941—150,000 tons—is expected to be equaled and perhaps surpassed.

Zinc consumption in pigments is not reflected in the table below, with the exception of the small quantity of metal shown as converted into zinc oxide. Of course, the bulk of the zinc consumed in pigments is derived directly from ore; and in the last four years, from 110,000 to 115,000 tons of zinc per year from primary sources, in addition to metal consumed in French process oxide mentioned above, have entered into the production of zinc oxide and lithopone. Production from secondary materials is in addition. Having in mind the pent-up civilian demand for rubber tires and paints, it is safe to say that the capacity for zinc pigment production is likely to be fully engaged in 1946. Pigments, representing such a large outlet, must certainly be reckoned with in reviewing the over-all zinc supply and consumption situation.

SLAB ZINC CONSUMPTION
(Tons of 2,000 lbs.)

	1943	1944	1945*
Galvanizing	253,201	315,991	333,741
Brass products	419,079	381,927	261,362
Zinc-base alloys	76,325	84,521	126,384
Rolled zinc	48,529	76,524	96,309
Zinc Oxide (French process)	11,496	20,198	18,330
Other	8,147	9,465	8,042
Total U. S.	816,777	888,626	844,168

Source: U. S. Bureau of Mines.
* Preliminary—November-December estimated by A. Z. I.

Exports

As part of the statistical report, details are given below of the exports of slab and sheet zinc, the principal products concerned in this movement. This is not intended to be a complete accounting. There are other zinc items exported in minor quantities, as well as considerable zinc which is shipped abroad in manufactured articles such as brass and galvanized products.

EXPORTS
(Tons of 2,000 lbs.)

	Slab Zinc	Sheet and Strip
1942	133,938	3,880
1943	97,439	2,281
1944	21,576	3,403
1945*	3,568	3,534

Source: U. S. Bureau of Mines.
* January-September, inclusive.

Stocks

According to the Institute's figures, slab zinc stocks were 259,333 tons at December 31. This includes both government- and producer-owned stocks on hand at U. S. smelters. In addition, between 500 and 1,000 tons are held by a few secondary producers not reporting to the Institute. Stocks of imported metal are not included.

Recently the following figures were published and stated to be the government stocks of slab zinc as at November 30:

SLAB ZINC STOCKS
(Tons of 2,000 lbs.)

Regular and special high grade	169,303
Intermediate	3,723
Brass special	16,493
Prime Western	68,504
Total Government stocks	258,023

Presumably these stocks include a fair amount of imported slab zinc, some of which may have entered in earlier times. On this assumption they are not difficult to reconcile with the Institute's figures.

According to Bureau of Mines reports, stocks of slab zinc at consumers' plants on January 1, 1945, were 64,859 tons and on October 31, 72,427 tons.

In September WPB published zinc concentrate stocks as of August 1 as follows:

ZINC CONCENTRATE STOCKS

	Tons
Government stocks	314,500
Industry stocks	178,200
Total recoverable zinc	492,700

Premium Prices and Subsidy Payments

On December 31, 1945, subsidy payments to smelters handling Joplin concentrates were terminated. The premium price plan for overquota mine production of zinc, which was originated in 1942 and expanded in 1943, carried through 1945. Legislation extending premium payments on strategic metals for one year ending June 30, 1946 was enacted by Congress on June 14, 1945.

As a matter of record, it is recalled that in February, 1942, the original premium for overquota mine production was fixed at 2.75c over the ceiling price for slab zinc, in other words, on the basis of 11c E. St. Louis. This was termed the "A" premium when, in February, 1943, two additional premiums of 2.75c each were announced—"B" premium on the basis of 13.75c, and "C" premium on the basis of 16.5c for metal.

Based on OPA figures, the average price of all zinc produced in the United States, including production at the ceiling price of 8.25c per pound plus the premium price production, is shown in the first column below. In the second column, the total overceiling payments paid are shown. Subsidy payments to smelters in 1944 and 1945 are not included. All figures are subject to correction due to later and retroactive adjustments.

PRICES AND PREMIUMS

	Average Zinc Price	Total Overceiling Payments
1942*	$9.06	$11,239,000
1943	10.55	33,979,000
1944	11.02	39,506,062
1945†	11.04	17,904,461

* February-December.
† January-June.

Government Controls

As mentioned elsewhere, ceiling prices on slab zinc continue to apply on the basis of 8.25c per pound for prime western grade f.o.b. E. St. Louis.

Conservation Order M-11-b, which imposed restrictions and prohibitions with respect to the use of zinc and zinc products, was revoked on June 14, 1945.

General Preference Order M-11, relating to deliveries of slab zinc, was amended effective August 1 to provide for the reestablishment of a "kitty" or reserve tonnage to be held by producers for delivery on WPB certified orders, the unreserved tonnage being available for delivery against unrated tonnage. This order was included in the blanket revocation issued by WPB effective August 20.

General Preference Order M-11-a, dealing with zinc oxide allocations and restrictive uses, was also canceled

TOTAL SLAB ZINC SMELTER OUTPUT (ALL GRADES) 1929-1945, Tons of 2,000 Lbs.

	(1) Stock at Beginning	(2) Production	(3) Total	(4) SHIPMENTS Domestic	Export and Drawback	Total	(5) Stock End of Period	(6) Unfilled Orders End of Period	(7) Daily Average Prod.
1929	46,430	631,601	678,031	596,249	6,352	602,601	75,430	18,585	1,730
1930	75,430	504,463	579,893	436,079	196	436,275	143,618	26,651	1,355
1931	143,618	300,738	444,356	314,473	41	314,514	129,842	18,273	822
1932	129,842	213,531	343,373	218,347	170	218,517	124,856	8,478	583
1933	124,856	324,705	449,561	343,762	239	344,001	105,560	15,978	890
1934	105,560	366,933	472,493	352,515	148	352,663	119,830	30,786	1,004
1935	118,005	431,499	549,504	465,687	59	465,746	83,758	51,186	1,182
1936	83,758	523,166	606,924	561,969	.....	561,969	44,955	78,626	1,429
1937	44,955	589,619	634,574	569,241	.....	569,241	65,333	48,339	1,615
1938	65,333	456,990	522,323	395,534	20	395,554	126,769	40,829	1,252
1939	126,769	538,198	664,967	598,972	.....	598,972	65,995	53,751	1,475
1940	74,262	706,100	780,362	674,615	88,165	762,780	17,582	125,132	1,929
1941	17,582	863,955	881,537	751,276	106,195	857,471	24,066	87,666	2,367
1942	24,066	929,770	953,836	733,918	151,650	885,568	68,268	52,752	2,547
1943	89,275	971,873	1,061,148	831,430	56,208	887,638	173,510	44,914	2,663
1944									
January	173,510	84,066	257,576	60,404	3,148	63,552	194,024	48,203	2,712
February	194,024	79,893	273,917	61,258	1,458	62,716	211,201	48,350	2,755
March	211,201	86,037	297,238	83,104	1,327	84,431	212,807	32,519	2,775
April	212,807	80,405	293,212	75,213	.....	75,213	217,999	32,058	2,680
May	217,999	80,497	298,496	80,540	285	80,825	217,671	29,634	2,597
June	217,671	73,067	290,738	65,488	297	65,785	224,953	27,570	2,436
July	224,953	72,947	297,900	63,193	.....	63,193	234,707	27,934	2,353
August	234,707	71,281	305,988	64,158	137	64,295	241,693	25,516	2,299
September	241,693	66,891	308,584	64,927	223	65,150	243,434	20,983	2,230
October	243,434	68,781	312,215	67,820	51	67,871	244,344	18,243	2,219
November	244,344	67,432	311,776	65,519	40	65,559	246,217	16,058	2,248
December	246,217	70,035	316,252	78,710	22	78,732	237,520	21,332	2,259
		901,332		830,334	6,988	837,322			
Monthly average		75,111		69,195	582	69,777	Daily average....		2,463
1945									
January	237,520	70,492	308,012	89,949	2,504	92,453	215,559	27,546	2,274
February	215,559	64,723	280,282	82,650	205	82,855	197,427	28,055	2,312
March	197,427	71,739	269,166	94,296	198	94,494	174,672	14,917	2,314
April	174,672	68,223	242,895	74,313	43	74,356	168,539	16,318	2,274
May	168,539	69,440	237,979	66,839	133	66,972	171,007	17,423	2,240
June	171,007	66,607	237,614	54,023	454	54,477	183,137	16,666	2,220
July	183,137	65,830	248,967	51,803	106	51,909	197,058	16,656	2,124
August	197,058	64,753	261,811	48,084	171	48,255	213,556	9,211	2,089
September	213,556	61,600	275,156	41,410	471	41,881	233,275	12,518	2,053
October	233,275	65,614	298,889	52,052	1,172	53,224	245,665	14,809	2,117
November	245,665	64,337	310,002	51,326	3,123	54,449	255,553	19,005	2,145
December	255,553	66,104	321,657	61,482	842	62,324	259,333	27,092	2,132
		799,462		768,227	9,422	777,649			
Monthly average		66,622		64,019	785	64,804	Daily average.		2,190

Commencing with 1940, production from foreign ores is included in this report which reflects the TOTAL OUTPUT of slab zinc of ALL GRADES, as reported by ALL PRODUCERS represented in the membership of the Institute.

effective August 20. General Preference Order M-11-l, relating to deliveries of zinc dust, was revoked on May 26. Limitation Order M-353 was revoked on March 26, when miscellaneous chemicals, including zinc sulfide, were made subject to General Preference Order M-340. On September 30, Order M-340 was revoked.

Import controls on slab zinc were removed as of September 5.

Government Stockpiling

Legislation to provide a government stockpile of strategic minerals and metals for national defense has been under consideration for a long time. The Thomas-May bill (S. 752) passed the Senate on December 20 and is expected to come before the House when it reconvenes during January.

Under this bill, the President will determine the materials which are strategic and fix the quantities and dates for the stockpiling. Committees from the industries concerned, to act in an advisory capacity, will be appointed by the chairman of the Stockpiling Board who will be named by the President. The bill provides that purchases shall be made from supplies in excess of current industry demand and not in excess of the current open market price. Unless stockpiled material is determined to be obsolescent for war purposes, it cannot be disposed of without six months' notice and the specific approval of Congress.

Future Outlook

With the end of the war, the zinc industry can quite properly congratulate itself on a job well done. The physical reconversion of the zinc industry from a wartime to a peacetime basis is not a serious problem. However, adjustments will be necessary to meet other problems which have been mentioned in this review.

On the basis of its indispensable value in any national emergency, and in the interests of our economic security, it appears to be generally recognized that a healthy domestic metal mining and refining industry is essential. If due weight is given to this premise in determining government policies relating to the national defense, tariff protection, and conservation of our mineral resources, there should be an active and useful future in store for the zinc industry.

Cripple Creek

Gold Mining Enters the Post-War Era

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By MERRILL E. SHOUP
President
Golden Cycle Corp.

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Despite Wartime Losses and Harmful Effect of WPB Limitation Order, This Industry Plans Restoration of Operations as Rapidly as Possible

THE past year produced events of great importance to the rehabilitation of our domestic gold industry. For the first time since October 8, 1942, when Order L-208 was entered by the War Production Board, gold mining in the United States and Alaska, was again permitted without limitations and restrictions. Order L-208 was relaxed by the War Production Board July 1, 1945. The lifting of this order had little effect upon increasing our gold production for 1945, since the tremendous damage done to the gold industry by this ill-advised order, plus the economic and labor difficulties following V-J Day could not, and will not be overcome in any short period of time.

L-208 a Complete Failure

The entry of Order L-208 by the War Production Board on October 8, 1942, and its disastrous results to the domestic gold mining industry will be the topic of discussion for many years to come, and probably will become, in the future, the subject of a thorough Congressional investigation. In this summary, however, for the last time, I am going to review and summarize again its results as they appear to us now that the war has ended and free discussion may be again engaged in without the writer being accused of obstructing the war effort.

The history of the use of gold, as a monetary medium, divides itself historically into three periods:

I. 2900 B. C., to October 8, 1942, A. D.
II. October 8, 1942, to the relaxing of Order L-208 by the War Production Board, July 1, 1945.
III. July 1, 1945 on into the future.

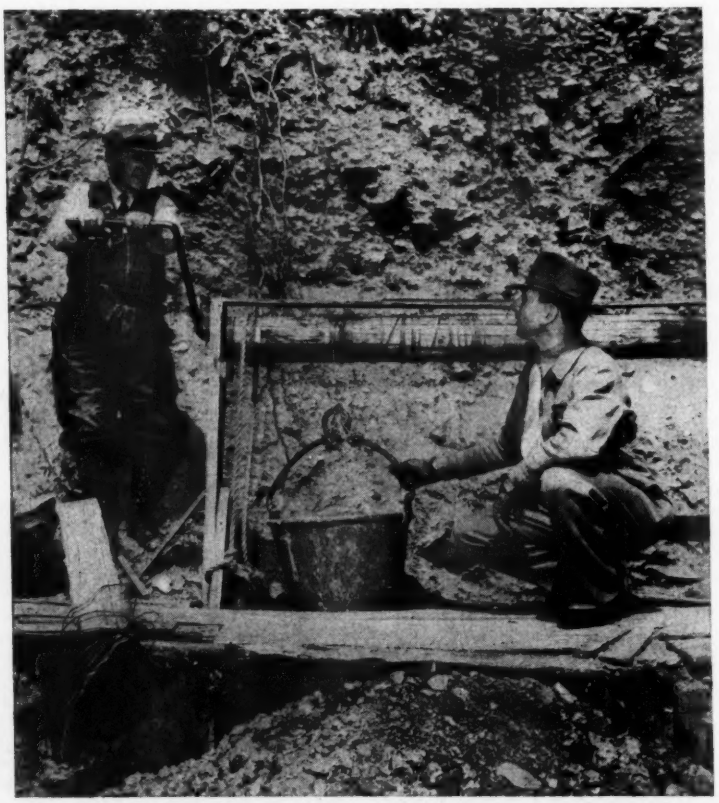
Nations Possessing the Greatest Gold Stock Have Always Ruled the World if Used Intelligently

During the period thousands of years prior to October 8, 1942, when Order L-208 was entered, gold had become, through no accident, but as the result of mankind's long experience with its use, the most acceptable universal world-wide medium of exchange. Its advantages as a standard world-wide medium of exchange have been summarized so many times by students of money, and are so generally known, that it is unnecessary to again reiterate all of them. Throughout world history, prior to October 8, 1942, that nation, or those nations, which at any given period, possessed the largest store of gold, always en-

joyed, during the period held, and provided it made the fullest use of it, world leadership and all of the powers which follows. Gold was used as early as the Fourth Egyptian Dynasty in 2900 B. C., and from this early period on to date, has continued pre-eminent among all the metals of the world as the standard medium of exchange. In historical sequence, Portugal, Spain, Holland, France, and after the Napoleonic Wars, England, each in turn, enjoyed world leadership while each had gold and was on a gold standard. England reigned supreme financially, economically, commercially, and as an empire builder during its most illustrious period from 1826 to 1914, during which time she was strictly upon a gold standard. When World War I started, 59 nations were on the gold standard, but after World War I until the devaluation of our dollar in 1933, the United States was the only great world power strictly upon a gold standard. During that period the United States achieved first rank as the world's greatest industrial and commercial nation, and today we occupy first rank among all nations of the world and have become the richest, greatest and most powerful nation, in every single respect that the world has ever seen.

Our gold stock increased steadily from 1914 to Pearl Harbor, at which time the United States owned $22,800,000,000 of the yellow metal out of the total monetary gold stock of the world estimated at $33,000,000,000. Since Pearl Harbor, we have lost about $2,700,000,000, and at present own about $20,100,000,000. The tremendous increase in our gold resources from 1914 to Pearl Harbor, was due to many factors, chief of which were the increased production of new gold; the political and economic deterioration in Europe and the flight of its liquid capital to the United States; the settlement of trade balances; the repatriation of foreign securities; and the reduction of American investments abroad.

As the nation's gold supply began to increase so rapidly, some of our domestic "crack-pot" economists began to worry about the "so-called United States gold problem," and sleepless nights affected their thinking to the extent that some even reached the point where they practically agreed with Hitler and other totalitarian national leaders about the alleged advantages of a barter or a managed currency system. Some leaders in this line of reasoning even went so far as to adopt foreign ideologies of totalitarian nations with respect to the use of gold as preferable to those American ways believed in and practiced by all sound-thinking patriots since the birth of our nation.



Hoisting ore at a small operation

For the First Time in History a Nation Prohibits Gold Mining

October 8, 1942, for the first time, not only in American history, but the written history of the world, the mining of gold was prohibited by a Government decree issued in direct violation of the provisions of the Constitution of the United States. As alleged justification for the entry of the order, the following reasons were publicly announced, the secret reasons never were:

1. Miners would transfer from gold to the copper mines.
2. Materials and supplies would be diverted from gold mining to the war effort where they would be more useful.
3. Gold was not essential to winning the war and its production during wartime constituted a waste of both manpower and materials.

Adding to the reasons above set out, one of our well-known Generals, now in Germany, stated to the representatives of the gold industry at the Washington meeting, where they were told that Order L-208 would be issued: "You can't shoot the Japs with gold bullets."

There is not now, nor ever was, any doubt in the minds of intelligent persons that Order L-208 was and has been a dismal failure, considered from any point of view. Almost no miners transferred from gold to copper mines. Entire gold mining communities were economically ruined, mines flooded, timbers rotted, shafts and tunnels caved, plants deteriorated and the task of restoring domestic gold mines to normal operating conditions will be long and extremely costly. Some mines never will be re-opened and their gold production will be lost to the nation forever. The United States lost much of its gold production from October 8, 1942, to date, at a time when gold is badly needed to help handle our postwar problems.

Not only was Order L-208 a complete failure, but to add to the grossly unfair treatment given our own gold industry by the War Production Board, the Administration helped in every way possible to stimulate the production of gold throughout the rest of the Allied World while our mines stood idle. The industry protested time after time against this unfair treatment of our own producers, but were always met with the statement that, "the shipment of vast amounts of gold mining supplies and equipment to these foreign nations was necessary to our war effort." Under Lend Lease, millions of dollars in gold mining equipment and supplies were sent to

Russia, South America and South Africa. Millions of dollars of gold mining equipment was manufactured during the war, and shipped out of our country to other Allied gold producing nations. The production of gold in Allied Nations from 1942 to date, shows a relatively small decline, compared to a drastic decline in the United States during the same period. Despite the professed disinterest and almost dislike of gold held by some of our economists, foreign nations have been, during the war, and are still using every possible device and scheme to secure our gold to build up their own supply, since their leaders, taking a leaf out of the written history of the world, realize that the nation which possessed gold, and uses its force intelligently, also acquires the power which goes with it.

Order L-208 Unconstitutional and Reimbursement of Losses Probably Will Be Made

It now appears probable that gold mines in the United States and Alaska will be reimbursed for at least a portion of losses suffered as a result of WPB Order L-208. Our industry still enjoys, together with horse-racing, the unique distinction of being the only industry shut down during the war by Government directive. Other peacetime industries were hurt by the impact of the war, but the damage suffered was directly or indirectly caused by the impossibility of securing adequate labor, necessary priorities, needed materials, and other essentials, not as a result of Government directives.

Several bills have been introduced in Congress designed to reimburse domestic gold mines for losses sustained from Order L-208. One introduced by Senator Murray, of Montana, and Representative Engle, of California, would grant relief to the owners of gold mines, operation of which were suspended or curtailed due to the issuance of Order L-208. Under its provisions, within six months after the effective date of the Act, the owner of a gold mine coming under the above definition would have the right to file a claim for the losses incurred, which losses would include the cost of placing the shut-down gold mine in a condition equivalent to that which it was at the time the mine was closed or its operations curtailed. What terms final reimbursement under the act would contain, cannot be forecast at this time, but there is little doubt that some method or formula to compensate gold mines will ultimately be approved by Congress.

It is now, and was at the time Order L-208 was entered, generally agreed by the legal profession that the gold mines in the United States and Alaska, affected by Order L-208, were deprived of their property without due process of law and in direct violation of the provisions of the Constitution of the United States.

Bretton-Woods Agreements Ratified

In the summer of 1945, the so-called "Bretton-Woods Agreements" were ratified by our Senate. It is too early to ascertain what effect these Acts, particularly the, "International Monetary Fund Provision," will have upon the future of gold. Among other provisions the "Fund" basically proposes to re-establish international currencies upon a gold basis with an attempt to eliminate or at least moderate, the so-called "disturbing rigidities," which, in the opinion of some economists, have characterized the gold standard. The Agreements are further intended to introduce a certain amount of elasticity to the gold standard.

The ratification of these Agreements was hurriedly pushed through the Congress by the Administration's use of the "war hysteria" arguments that President Truman needed all of the weapons possible in connection with the World Peace Meetings then being held in San Francisco.

Before the Agreements become fully effective they must be ratified by scores of other world nations. Many events have happened throughout the world since V-J Day and the ending of the war. England has gone socialistic and there is much dissatisfaction now being openly expressed by English leaders against ratification of these "Agreements" by England. There appears at present the distinct possibility that the leading powers of the world will never ratify the "Bretton-Woods Agreements" in their present form, or even in any amended or modified form.

Therefore, it seems futile, at this time to further discuss the ultimate effect of the various Bretton-Woods Agreements upon the gold problem.

The Industry Starts to Rehabilitate Its Properties

The chief problem confronting the gold industry, with the end of the war and the relaxing of Order L-208, is to restore operations as quickly as possible to a normal peacetime basis. Some adverse factors working against this objective have appeared upon the horizon, and these may get worse before they get better.

1. During the war, due to the need for speed in the production of supplies, wages and the cost of labor increased tremendously. This factor will affect wage scales paid by the gold industry, since, while gold mine operators cannot afford to pay a labor scale equal to that paid by other peacetime industries, yet in order to compete for labor, the gold mining wage scale must be based upon a scale somewhat comparable to enable the industry to secure sufficient labor with which to operate.

2. Some months will elapse before gold camps can secure an adequate supply of labor even at a higher wage scale. Labor scarcity will exist until almost all men in the armed services have been discharged and returned home, and until such time as workers from closed defense plants have spent their savings, given up hope of Government aid and have decided to return to work.

3. Another adverse factor which will operate for some months, is the impossibility of securing necessary machinery, supplies and equipment with which to resume operations, plus the fact that the cost will be considerably higher than in 1942. The price paid for gold is fixed by the United States Government. With a fixed selling price, all added costs which the industry will have, resulting from higher wages, higher material and equipment costs, must be absorbed by the producer. This will force them to mine the higher grades of ore, since the lower grades which could be mined at a profit prior to 1942, cannot be mined without a loss until production costs have declined, which may not be for some years yet.

Increased Price for Gold

Discussion still rages pro and con regarding the possibility of an increased gold price. There is no serious discussion regarding a decreased selling price. It is my opinion that gold must, in the future, sell at a higher price. Our Government will ultimately be forced to raise the domestic gold price, because of the higher price gold is now selling and will sell in the open markets of the world. During the war gold sold and today is selling in many parts of the world at a much higher price than that paid by the

United States Government. Gold sold last year at prices from $45 to $55 in Cairo, $50 to $55 in Buenos Aires, $66 to $80 in Bombay. The tremendous debt owed by our Government as a result of the war and future reconversion costs, will put pressure upon administration leaders to settle this debt upon the lowest possible basis. It is easier to vote to pay off a debt with devalued dollars, than to vote to levy higher taxes. In the history of the world, administration leaders have usually followed the line of least resistance in paying a national debt, operating upon the well known principle of, "plucking the greatest number of feathers from the goose with the least squawk." No reason exists to believe human nature has changed in this respect.

The nations now suffering from an avalanche of inconvertible paper money, one day will have to heed the demand of their peoples for a return to "hard money." Throughout the world's history, mankind has always had sad and disastrous failures and experiences with incontrovertible paper money and has always finally returned to "hard money" as a solution of "paper money troubles."

Mankind has always turned to gold and silver for monetary purposes and gold, of all known metals, has the qualities best suited for a world-wide standard medium of exchange. When the present chaotic world-wide conditions are straightened up, as they must be, the demand for gold will be the greatest in the world's history. This demand balanced against a relatively small supply will force the price of gold to higher levels than have ever heretofore existed.

Gold of all metals, possesses all the essentials of the best medium of exchange ever evolved. It exists in sufficiently large quantities to meet exchange needs, yet is not so abundant as to lose its desirability; it is so durable it will not lose its exchange power through decay or deterioration; it can be divided into small or large units and used in transactions involving large or small amounts; it is homogenous and all parts have a uniform value and can be equally divided; it is portable, possesses cognizability, has stability of value and is accepted in all parts of the world.

PRODUCTION OF GOLD
(in thousands of fine ounces)

	World	[1] U. S.	Canada	Union of So. Africa	Russia and Siberia
1929	19,673	2,203	1,928	10,412	1,100
1932	24,306	2,449	3,044	11,559	1,990
1934	27,318	2,916	2,972	10,480	4,000
1935	30,354	3,619	3,285	10,774	5,000
1936	34,230	4,296	3,748	11,336	6,500
1937	35,723	4,753	4,096	11,735	[5]5,900
1938	38,030	5,008	4,725	12,161	[5]5,800
1939	39,485	5,559	5,094	12,822	[5]5,000
1940	40,907	5,920	5,311	14,038	[3]4,000
[2]1941	40,818	5,981	5,331	14,386	[3]4,000
1942	35,614	[4]3,619	[4]4,841	14,121	[3]4,000
1943	29,813	[4]1,365	[4]3,652	12,800	[3]4,000
1944	27,070	[5]989	[5]2,885	12,300	....

[1] Production of the Philippine Islands included with the United States.
[2] Preliminary and partly estimated.
[3] Estimated.
[4] Actual.
[5] Estimated by Standard & Poor's.

Pouring gold from refining furnace

We Help Foreign Nations to Mine Gold While Prohibiting Domestic Production

Some idea of the effect of Order L-208 and other war and economic factors upon the production of gold in the United States, particularly from 1941 to 1944, is shown by the above table.

It will be noted that the 1944 United States production of gold in fine ounces was only 989,000 vs. 5,981,000 in 1941, the last nearly normal year, while the gold production of Canada was 2,885,000 fine ounces in 1944 compared with 5,331,000 in 1941; that of the Union of South Africa 12,300,000 oz. in 1944 vs. 14,386,000 oz. in 1941, a decline of only 2,086,000 oz. The relatively small decrease in the gold production of the Union of South Africa during the period 1941 vs. 1944, strikingly illustrates the results of help given by the United States Government to other nations, by furnishing it all necessary gold mining equipment to mine gold, while our own gold mines were shut down and prohibited from producing gold.

Canada is experiencing one of her greatest gold booms. Practically all Canadian producers operated during the war, hence they do not face the same handicaps in returning to normal operations as do the American producers. They do not have the same problems as American producers have to rehabilitate mines, de-water and reacquire machinery and equipment loaned or sold elsewhere.

Despite the tremendous damage suf-

(*Continued on page* 111)

Silver Serves Throughout the War

All-Out Emergency Drove Home Realization of Metal's Importance To Economic and Industrial Structure of United States and Our Allies

By HON. PAT McCARRAN
U. S. Senator
Nevada

UNDER a special Act of Congress, known as the Green Act, approved July 12, 1943, Treasury silver was sold to industry chiefly for war purposes and, incidentally, for the manufacture of civilian goods. This Act terminated on December 31, 1945.

The purchasers of Treasury silver are now desirous of extending the precedent for an additional two years. Members of Congress are now being flooded with appeals from retail jewelers urging the passage of legislation now pending before the Senate Committee on Banking and Currency. Congressman Joseph W. Martin, Jr. (R., Mass.), is the author of a bill (H. R. 4590) which passed the House on December 19, 1945. This bill is identical with a bill (S. 1508) introduced by Senator Theodore F. Green (D., R. I.) on October 24, 1945, which was referred to the Senate Banking and Currency Committee. These bills provide for the sale or lease of Treasury "free" silver "for manufacturing uses, including manufacturing uses incidental to reconversion and the building up of employment in industry * * * at not less than 71.11 cents per fine troy ounce * * *," this authority to expire two years after the date of enactment. These bills have not received the approval of the Senate Committee.

I introduced three bills during the closing weeks of the first session of the 79th Congress. One bill (S. 1486) introduced on October 15, 1945, proposes to repeal the tax on profits arising from silver transactions under the Silver Purchase Act of 1934, and to amend the Act of July 6, 1939, to direct the Treasury to pay the producer of domestically mined silver the full monetary price of $1.29 an ounce for his silver delivered at the Mint. This bill was referred to the Senate Committee on Finance, where it has not yet been voted on.

Another bill (S. 1521) introduced by me on October 26, 1945, is also designed to pay the producer of domestically mined silver the full monetary price for his silver delivered at the Mint by amending the Act of July 6, 1939. That is the full scope of S. 1521, which was referred to the Senate Committee on Banking and Currency and had not come up for consideration at the time this article went to press.

I also offered a third bill (S. 1728) on December 21, 1945, which proposes to amend the Act of July 6, 1939, to pay the producer of domestically mined silver the monetary price of $1.29 an ounce; to amend the Silver Purchase Act of 1934 by repealing the tax on profits arising from silver transactions, and two other minor amendments, and to authorize the sale of Treasury silver at its monetary value, without time limit, for manufacturing uses. This bill was also referred to the Senate Banking and Currency Committee, and had not been voted on at the time this article went to press. This bill (S. 1728) contains all of the provisions of these various bills except that it stipulates a price of $1.29 an ounce for Treasury silver rather than 71.11 cents an ounce as proposed in Senator Green's new bill.

Compromise on Silver Price

Immediately following the consideration of Senator Green's bill (S. 1508) on December 18, 1945, Senator Wagner, Chairman of the Banking and Currency Committee, stated publicly that he thought a compromise in price must be reached before his Committee would approve the legislation. He did not indicate any particular price except that of approximately $1 an ounce, suggested by another Senator. Neither did he specify that any compromise agreed upon would apply equally to the price paid to the producers of domestically mined silver as well as to the silver sold by the Treasury for manufacturing uses.

The Treasury Department is on record as having approved the Green bill in the form in which it was introduced, but the attitude of the Treasury toward any one of my bills has not yet been made known.

Of the total amount of 167,352,000 ounces of Treasury silver sold under the Green Act from July 12, 1943, until December 31, 1945, 139,000,000 ounces were sold up to November 30, 1945, and 28,350,000 ounces were sold during the month of December, 1945, including 6,000,000 ounces sold to the Philippine Government. The average amount sold monthly during the life of the Green Act was approximately 5,770,000 ounces.

A Service to Britain

The price of 71.11 cents an ounce for silver sold under the Green Act is the lowest price at which any Treasury silver was ever sold by the United States Government. The only other occasion when silver was sold by the Government at less than its monetary price of $1.29 per fine troy ounce was under the terms of the Pittman Act of April 23, 1918, when approximately 258,580,000 silver dollars were melted down and 200,000,000 fine ounces of silver derived therefrom sold at $1 an ounce to the British Government to relieve the strain on banks in India. The natives of India, true to their tradition, were attempting to redeem in silver their paper rupee notes and there was not enough silver on hand to make good their redemption pledge. At that time the United States Government did not have sufficient bullion silver on hand, and agreed to melt down enough standard silver dollars to yield 200,000,000 fine ounces for shipment to India. No publicity was given the enactment of this benevolent legislation as it might have caused Great Britain "to lose face" by admitting the indispensability of silver money. In commenting upon the gen-

erosity of the United States Government in furnishing Treasury silver for use in India, and other unspecified portions of the British Empire, Lord Reading, then Ambassador to the United States, stated in a speech before the English Speaking Union in New York on February 12, 1921, as follows:

It was a moment when there was a great scarcity of silver in India as well as elsewhere, and in India it was of more consequence than in most places. There was a moment at which we were very hard pressed to find the metallic reserve, particularly the silver which was necessary in India, it being incumbent that the paper note issue should be convertible immediately into the silver rupee. Owing to this great scarcity our difficulty was to find the silver. There was no means but one; that seemed impossible. In the vaults of the American Treasury there were vast stores of silver preserved there as the financial backing against the notes which were issued—silver which could not be disturbed. No matter how much it was wanted it could not be taken out of the vaults of the United States except by act of Congress. It was then that the United States administration and members of Congress of every party joined in an endeavor to meet the situation by passing an act of Congress without discussion, because discussion would have been serious.

Practically without any debate this measure was passed in almost record shortness of time. It became a law within a very few days of its seeing the light. The vast millions of ounces of silver from the vaults were released and were sent across by arrangement between America and ourselves to India, with which America had no concern but simply because it was necessary at that moment to help the British Empire. Nothing was said of this. Even the newspapers — remember the newspapers were conscious of it—knew as well as possible what was happening; but they did not mention it because they knew that if they did they would detract largely from the generous services that America was rendering and they passed it over in silence. Nothing has been heard of it or said of it since. I do not know myself that now, long after the war, America has ever claimed in any way our recognition of that service.

The Green Act

The Green Act of 1943 was passed after months of consideration. The proponents of the bill represent constituents who manufacture silverware, jewelry and photographic equipment and supplies. The occasion was seized upon as one from which an opportunity might develop later on to follow the example established in London many decades ago which enabled manufacturers and speculators to purchase silver from the Bank of England at the market price, fixed daily by four London bullion brokers. The theory was that the four London brokers would weigh the demand against the available supply of silver each day and fix the commercial price either up or down depending upon the direction and force of the pressure. As Great Britain controls only 9 per cent of the world's production of silver the Bank of England has for more than 100 years resorted to procedures designed to attract silver on an ebbing market and to sell it at higher prices. India usually buys silver more heavily on a rising market.

If American brokers and other speculators could control the price at which silver for commercial use could be purchased from the United States Treasury it would not be long before the price would reach such a low mark that many mines in this country would be compelled to shut down. All silver-producing mines that would be forced to close are among those which also produce copper, lead, or zinc and silver as a byproduct.

Lend-Lease Silver

While the war was in progress Treasury "free" silver was lend-leased to foreign countries without a price being stipulated and without any specific authority from Congress. The total amount of silver lend-leased was 408,000,000 ounces. The principal beneficiaries were India, Great Britain, the Netherlands Empire, and Saudi Arabia, while small lots were lend-leased to Australia, Ethiopia, France and the Fiji Islands. It was agreed with these countries that the silver so lend-leased is to be returned on an ounce-for-ounce basis within five years after the termination of the war.

The purpose of lend-leasing silver "for monetary and industrial uses" abroad was chiefly to enable Great Britain to control the price at a low level. Most of the silver contracted for by Great Britain was consigned to India and sold in bars. Very little, if any, was coined into rupees. These sales of bar silver were intended to absorb some of the excess paper rupee currency which the "authorities" claimed would otherwise be used to boost commodity prices. Naturally, the people of India prefer silver to paper currency issued by the Bank of India, which is British controlled.

Treasury Policy

The Treasury Department has not as yet attempted to reach either objective of the Silver Purchase Act of 1934, viz., to acquire silver until the price reaches $1.29 an ounce, or until the monetary value of the silver acquired equals one-fourth of the gold and silver reserves of the United States. Former Secretary Morgenthau testified before the House Committee on Appropriations on December 10, 1942, that "if it were left to me I would strike the silver legislation right off the books and start again." When questioned subsequently by members of the Senate Special Silver Committee Mr. Morgenthau stated that he did not necessarily express the opinion of the Treasury Department; that he was merely expressing his own views.

It is no wonder that the Treasury Department failed to administer the law in a manner that would admit of reaching either objective. On the other hand, the Department has grasped every opportunity to reduce the amount of silver in the Treasury and to keep the price on a low level.

It was Secretary Morgenthau who first proposed to members of the Senate Silver Committee that silver be lend-leased to foreign countries. Although this proposal met with the opposition of the Senate Silver Committee, the former Secretary, who appeared before that committee with Mr. Stettinius, at that time Lend-Lease Administrator, and Mr. William Batt, a vice chairman of the War Production Board (who also showed more interest in transferring some of the Treasury silver stocks abroad than in utilizing the silver on hand for currency purposes in the United States), inaugurated the silver lend-lease program on his own volition.

Treasury Silver Stocks

Since the acquisition of silver under the Silver Purchase Act of 1934 the ratio of silver to gold and silver in monetary stocks reached the highest point of 19.1 in 1938, and the lowest point of approximately 15 in December, 1945. The total gold stocks in the Treasury reached an all time high of $22,736,700,000 in 1942, and on December 31, 1945, the gold stocks had decreased to approximately $20,000,000,000. The all-time high mark of silver in the monetary stocks was reached in 1942 and amounted to $4,306,300,000 (3,338,217,054 ounces) at $1.29 an ounce, whereas the low mark since that time of approximately $3,569,205,500 (2,767,601,200 ounces) was reached in December, 1945.

In view of the fact that lend-lease shipments to foreign countries and

sales of Treasury silver for manufacturing purposes have ceased, it may be anticipated that henceforth the ratio of silver to gold and silver in the monetary stocks will increase as gold continues to flow to foreign countries. If, on the other hand, new legislation is enacted to authorize the sale of additional silver to the silver-using trades, it may be expected that such sales would further decrease the Treasury stocks of silver by approximately 40,000,000 ounces during the year 1946, this amount representing the potential shortage for the year after taking into consideration the generous inventories now on hand (sufficient to last four months) together with estimated domestic production of 35,000,000 ounces and imports of 20,000,000 ounces. Domestic production and imports would increase sufficiently to meet the demand if the price should rise to $1.29 an ounce.

COMPONENTS OF SILVER MONETARY STOCK AS OF NOVEMBER 29, 1941

	Fine ounces
Silver Held in Treasury	
Silver securing silver certificates and Treasury notes of 1890:	
Silver dollars	376,100,000
Silver bullion	1,137,200,000
Silver in the General Fund (bullion not monetized)	1,355,900,000
Silver in the General Fund (subsidiary coin)	2,700,000
Silver in the General Fund (held for recoinage)	1,200
Total silver held in the Treasury	2,871,901,200
Silver Outside the Treasury	
Silver dollars	47,800,000
Subsidiary coin	352,000,000
Total silver monetary stock of the United States	3,271,701,200
Silver Leased for Nonconsumptive Uses	
Silver leased to industry (maximum as of March 11, 1944)	903,000,000
Outstanding at close of December 31, 1945	877,715,175
Total returned to Treasury (as of December 31, 1945)	25,284,825
Silver Sold for Consumptive Uses	
Under Green Act as of December 31, 1945	167,352,000
Silver Lend-Leased to Foreign Countries	
Total as of September 30, 1945	408,000,000

Silver Acquired By Mints and Assay Offices Since Pearl Harbor

	Domestic	Foreign	
December, 1941	5,800,000	3,700,000	
January-December, 1942	47,800,000	14,400,000	
January-December, 1943	5,400,000	none	
Total acquired since Pearl Harbor	59,000,000	18,100,000	77,100,000

Recapitulation

Total silver stock as of November 29, 1941		3,271,701,200
Silver acquired since November 29, 1941		77,100,000
Total		3,348,801,200
Sold under the Green Act	167,352,000	
Lend-Leased	408,000,000	
		575,352,000
Total silver stock as of December 31, 1945		2,773,449,200

Silver Leased for Nonconsumptive Uses in the United States

A total of 903,000,000 ounces of silver was leased to Defense Plants Corporation, a subsidiary of RFC, for nonconsumptive uses in Government-owned and privately owned war plants, of which 25,284,825 ounces had been returned to the Treasury as of December 31, 1945. Of the remaining 877,715,175 ounces still in use in these plants, 77,715,175 ounces were leased from the seigniorage fund (or profit silver, which the Treasury Department prefers to call "free" silver), and 800,000,000 ounces were supplied from monetized silver bullion, against which silver certificates have been issued and placed in circulation.

The accompanying compilation shows at a glance the status of silver at the time of Pearl Harbor and on December 31, 1945.

During the past four years the Mints of the United States have coined 268,469,155 ounces into United States subsidiary (silver) coins, an annual average of 67,017,290 ounces. Our Mints have also coined large amounts of silver for other governments. During that period the Mints also coined an unprecedented amount of minor coin (pennies and 5-cent pieces) for circulation in the United States.

Silver Imports

Silver imported into the United States during the past four years (this information was not released for publication during the war) is shown in the table on page 58.

Many of the recipients of Treasury "free" silver are among those who criticised the Congress for passing the acts under which the silver was acquired and which made it possible for them to buy silver from the Treasury at a discount of 45 per cent off the monetary price.

To those critics who have characterized the Treasury silver stored at West Point as "a hoard of worthless metal" it may be pointed out that during World War II:

903,000,000 ounces were leased to the Defense Plants Corporation and converted into bus bars for use in war

plants, where they served through two years of war;

173,000,000 ounces were sold for war and civilian manufacture;

1,600,000,000 ounces served as backing for silver certificates (which are still in circulation);

408,000,000 ounces were lend-leased to foreign allied governments for coinage and industrial uses;

105,127,000 ounces are now in circulation in silver dollars ($135,000,000);

600,000,000 ounces are now in circulation in the form of dimes, quarters and 50-cent pieces, and constitute the only subsidiary money in circulation in this country.

All Treasury silver has been monetized except approximately 250,000,000 ounces of "free" silver.

The silver leased to the Defense Plants Corporation and probably one-half of the silver sold under the Green Act served "honorably" as an aid in winning the war, but it should be noted that if 408,000,000 ounces of the Treasury silver lend-leased to foreign countries and the silver sold under the Green Act for nonessential manufacture, amounting to approximately 80,000,000 ounces, had been used as backing for silver certificates and placed in circulation four years ago in lieu of Federal Reserve notes, $630,000,000 of additional silver certificates would have been issued, thereby reducing the bonded indebtedness of the Government and the fiduciary issue of Federal Reserve notes by $630,000,000 and saving the tax payers of this country at least $50,000,000 in interest alone.

The cost of subsidizing silversmiths and jewelry manufacturers through the sale of Treasury silver at a discount of 45 per cent during the past two and one-half years amounts to approximately $46,400,000.

Every ounce of silver owned by the Treasury is worth $1.29 to the Government and to the people of this country and should be issued as money for their benefit.

Year	SILVER IMPORTS		
1942		Dollars	Ounces
	(a) Ore and base bullion	$12,718,949	34,954,485
	(b) Bullion refined	28,002,573	73,115,006
	(c) Foreign coin	225,542	
	(d) U. S. coin	163,085	
		41,110,149	108,069,491
1943			
	(a) Ore and base bullion	17,667,905	40,600,595
	(b) Bullion refined	9,933,867	22,289,129
	(c) Foreign coin	10,447	
	(d) U. S. coin	290,741	
		27,902,960	62,889,724
1944			
	(a) Ore and base bullion	16,567,093	37,680,234
	(b) Bullion refined	6,093,323	13,678,771
	(c) Foreign coin	8,541	
	(d) U. S. coin	704,080	
		23,373,037	51,359,005
1945	(Through November only)		
	(a) Ore and base bullion	14,160,834	30,091,730
	(b) Bullion refined	9,077,987	16,104,531
	(c) Foreign coin	2,759	
	(d) U. S. coin	863,391	
		24,104,971	46,196,261

Ferro-Alloy Metals

While Ferro-Alloy Record for War Needs Excellent, Peace-Time Demands Dependent Upon Probable Steel Production

By G. K. HERZOG
Metallurgical Engineer
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THE essential nature of ferro-alloys and related metals and their ores in the production of war equipment was early recognized by the Government, and even before Pearl Harbor steps were taken to ensure a sufficient supply for all war needs. On the impact of the war, orders were issued limiting the use of some of the alloys to what were considered the more important applications. Extraordinary steps were taken to ensure the importation of an adequate supply of those ores which are not available in this country in sufficient quantity or of a suitable metallurgical grade. Programs were instituted for beneficiating and utilizing the low grade ores of some of the alloys, as for example chromium and manganese, available in this country. Premium prices were paid for some ores from high cost producers. A series of steels known as the National Emergency (N. E.) steels was developed by the steel industry to utilize to the greatest possible advantage the available supplies of the various alloys. Government and industry cooperated in specifying and using those steels of the lowest possible alloy content that would give the required service. Finally, most of the alloys were restricted to strictly war uses. While there were at times critical shortages of some of the ferro-alloys, due usually to a sudden shifting of the military program, no major program was ever seriously delayed because of the lack of sufficient ferro-alloys.

Some of the controls and restrictions were eased as early as the latter part of 1942 or early 1943, but a number of them were still in effect at the beginning of 1945 and were not revoked until after the victory over Japan. At the end of 1945, all restrictions on the use of ferro-alloys had been revoked and estimates of future requirements can be made on a peacetime basis. Such a large percentage of the ferro-alloys and metals is used in steel industry that any estimate of probable future ferro-alloy requirements must in effect be an estimate of the probable steel production. This would seem to be quite simple but there are a number of factors which complicate the situation. There is no doubt that there is such a huge pent-up demand for automobiles, refrigerators, railway cars, housing and many other goods that an immense tonnage of steel—probably

equivalent to 80 per cent of the maximum reached in the highest war year —would be required each year for the immediate postwar years. However, strikes and threats of strikes may well prevent our making anywhere near this tonnage. Just prior to the war, the automotive industry consumed about 40 to 45 per cent of the alloy steel produced, and any protracted strike in this industry would certainly have a major effect on alloy steel production and on ferro-alloy requirements.

Some of the ferro-alloys, notably ferromanganese and ferrosilicon, while used to some extent for their alloying effect are to a large extent used for improving the cleanliness and the hot working properties of all types of steel—both the plain carbon and alloy varieties. Practically no steel of any kind is made without the addition of manganese, and a very large percentage is treated with silicon in the form of one of the several grades of ferrosilicon. The use of manganese for this purpose has become so standardized that the consumption of manganese in the steel industry can be quite closely estimated for any assumed total steel production. The consumption of silicon may also be quite closely estimated from steel production, but in this case, there has been a rather slow but gradual increase in the amount of silicon used per ton of steel produced during the last several years because an increasing percentage of steel is of the killed or semi-killed rather than the open or rimming type.

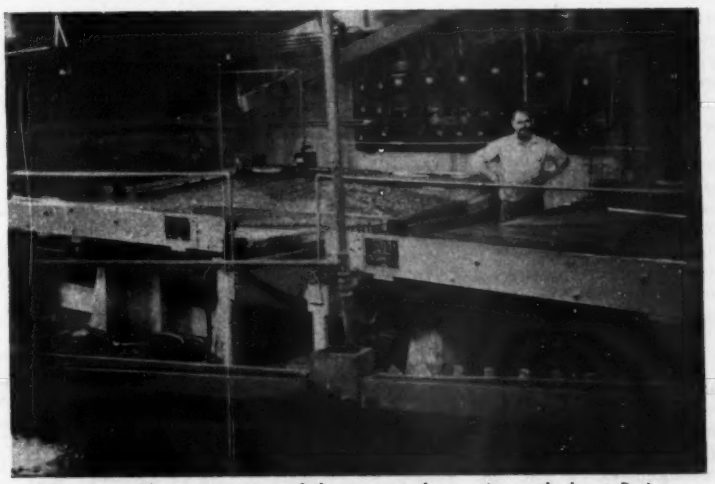
Alloy Steel

The most optimistic estimates of steel production in the immediate post-war years are that it will be about 80 per cent of the highest war year—well above any pre-war year. As the consumption of ferromanganese and ferrosilicon varies almost directly with steel production, and as the ferro-alloy industry was able to take care of the peak war demand, it is felt that the situation in both of these ferro-alloys will be easy for some time to come. There are of course, ample supplies of silica in forms suitable for the production of ferrosilicon available in this country, and present prospects are that when the transportation difficulties in the manganese ore producing countries and the ocean shipping situation are fully cleared up we will be able to obtain sufficient supplies of high grade metallurgical ore to take care of our requirements.

The consumption of ferro-alloys other than ferrosilicon and ferromanganese is more closely related to alloy steel production than it is to total steel production. Furthermore, the consumption of alloys per ton of alloy steel produced is not a fairly fixed quantity but varies quite widely as the demand for the different types of alloy steel varies. Total alloy steel production in 1945 was about 8,600,000 net tons which was a substantial reduction from the 10,500,000 net tons produced in 1941 or the all time peak of 13,000,000 tons produced in 1943. There was, however, not a corresponding decrease in the consumption of ferro-alloys. This fact can be easily explained but makes it rather difficult to generalize in regards to future requirements of ferro-alloys.

One of the outstanding features of alloy steel production is the steady increase in the output of high chromium alloy steels commonly known as the stainless or heat and corrosion resistant steels. There was a fairly uniform and quite rapid rate of increase in the production of these steels for several years immediately preceding the war, and this trend continued until the end of the war and is expected to continue, although probably at a somewhat reduced rate, for some time to come. These steels, because of their resistance to corrosion, resistance to scaling at high temperatures, their high strength at both high and low temperatures, their ease of fabrication, their attractive appearance when polished, and the ease with which polished surfaces can be kept clean and sanitary have resulted in a wide application in the chemical, food, beverage, transportation, and power industries, and for architectural uses. The development of new aircraft utilizing the rocket or jet principle of propulsion has led to a renewed interest in new power units of the gas turbine type which must operate at high temperatures to obtain the reasonably good fuel efficiencies. The only alloys which can give adequate service under the conditions imposed in this type of service are of the high chromium type, probably modified by one or more other alloying metals. Because of the pent-up demand already existing for the high chromium alloys of the stainless or heat and corrosion resistant type, and the possibilities for increasingly large use in the gas turbine and power fields, there is good reason to believe that the production of the high chromium alloy steels will continue for some time at the highest wartime rate and may even exceed it.

The outlook for the other alloy steels is not so clear. It is quite likely that some of the standard S.A.E. steels will be replaced by N.E. steels of lower alloy content. On the other hand, it is probable that the output of the low alloy structural steels will be increased. For several years prior to the war, alloy steel production was running at about 6 per cent of total steel production and is currently running at about 8 per cent. It may well become stabilized at about the latter figure for the immediate postwar years. During the war, much special equipment, such as armor plate for example, was made of special alloy steels which will find little or no application for civilian uses. The exigencies of war forced the use of certain steels in place of those that had found favor in peacetime, but there are indications that now that all restrictions are removed users will again favor steels they were accustomed to using prior to the war. War experi-



Vibrating tables recover part of the tungsten by gravity methods, at Boriana

ence has shown that the various alloy steels in general use before the war were based on sound metallurgy and not on the whim of alloy or steel producers. In view of this, it is reasonable to assume that the relative amounts of the various engineering alloying steels in the post-war period will be quite similar to those of the pre-war period rather than those of the war period.

Manganese

Figures on the imports and consumption of manganese ore which have been considered confidential during the war were released by the Bureau of Mines in September. They showed that due to the foresight of producers and the Government the stocks of manganese ore in this county were never dangerously low at any time during the war. Ocean shipping capacity is still limited and some difficulties still exist in getting high grade ores to seaboard but there is every indication that these difficulties will eventually be surmounted so that we can depend on getting a sufficient supply of this important ore.

Because the stock of metallurgical manganese ore in this country is ample for our present needs and imports should be able to take care of future requirements, the operations of practically all projects concerned with the utilization of substandard domestic ores have been abandoned.

Chromium

As only a relatively small part of the chrome ore mined in this country is classed as metallurgical grade, it has never had a marked effect on the supply of ore available for the production of ferrochrome. By supplying part of the demand for chemical grade ore, it has undoubtedly eased the over-all shortage and make it possible during the war to use for metallurgical purposes some of the ores which in normal times would have been used for the production of chemicals. Now that the war is over and most of the pre-war sources of high grade metallurgical ore are once again available, it is expected that the domestic ore will again play only a very minor role in the chromium situation.

Stocks of high grade metallurgical ore in the hands of the Government and ferro-alloy producers are sufficient for immediate requirements, and while the shipping situation is not yet entirely satisfactory, no trouble is anticipated in importing sufficient ore to take care of all possible requirements.

Tungsten

In the early part of 1945, it appeared for a while that the relatively large stocks of tungsten on hand at that time, which it had been thought would be sufficient for all possible contingencies, might not suffice to properly take care of the military program adopted at about that time. However, before this program could get well under way, it was cancelled because of the victorious ending of the war, and tungsten supplies immediatlely became ample for all requirements.

Consumption has declined severely since the ending of the war, and present stocks are considered more than necessary on a peacetime basis. The future prospects for domestic tungsten ore are somewhat clouded. No new non-military uses for tungsten were developed during the war so that in the immediate post-war period it will probably be used to about the same extent as before the war making due allowance for general industrial activity. Domestic production could take care of all requirements, but as in the past, only the low cost production units will be able to compete with imported ore, and at least some of our requirements will have to be imported.

Molybdenum

As the United States produces by far the greatest part of the world's output of molybdenum ores and has large reserves, there is no question about the adequacy of our supply of ore to take care of any anticipated future demands for some years to come. In common with all other alloying metals, consumption has declined substantially since the ending of the war, and stocks at present are ample to take care of requirements at the present rate for some time.

While, in general, the post-war uses of molybdenum will follow quite closely the pre-war pattern, there are indications that it will be used to a somewhat greater extent in the production of alloy steels than it was prior to the war.

Vanadium

There was, of course, a tremendous increase in the consumption of vanadium during the war years. To take care of this greatly expanded demand, it was necessary to increase mining and milling facilities to an extent which appears to make them more than ample for any anticipated demand for vanadium during the immediate post-war years.

Present stocks of vanadium ore are sufficient to take care of needs for some time to come and no difficulty is expected in obtaining sufficient supplies of domestic and foreign ores to take care of future needs.

Nickel

The consumption of nickel continued high during the early months of 1945 while both the European and Japanese phases of the war were still in progress. During the last half of the year consumption declined substantially. It is expected that with a few exceptions the pattern of post-war nickel consumption will not differ greatly from the pre-war pattern. A somewhat lower percentage of nickel will probably be specified in some of the engineering steels but any reduction in nickel consumption caused by this will be more than counterbalanced by the increased use of nickel in the stainless steels and the heat and corrosion resistant alloys.

Domestic production is small and will probably continue so indefinitely. For the next several years Canada will probably, as in the past, continue to furnish the bulk of our requirements. Whether the Cuban nickel oxide imported during the latter part of the war can be supplied at a profit to the producer during peacetime depends on a number of factors that cannot be adequately evaluated at this time. The prospects for obtaining any substantial amounts of nickel from Brazil are even more indefinite.

It seems certain that no difficulty whatsoever will be experienced in obtaining a sufficient supply of nickel for all anticipated needs for the next several years.

Cobalt

Cobalt became of great importance in the production of some of the most essential war equipment and its use expanded greatly during the war. The consumption during 1945 was somewhat less than in 1944. For the first half of 1945 it was at a rate well above that for 1944 but there was a substantial decrease in demand on the ending of the war. Stocks of cobalt in the hands of consumers are known to be ample for all anticipated requirements for the near future. There is also a considerable stock of cobalt held by the Metals Reserve Corporation so that at present the situation is definitely easy.

While there is a small production of cobalt ore in the United States, the bulk of our requirements is imported. There is every indication that sufficient supplies of cobalt will be readily available for some time to come.

Titanium, Zirconium, Columbium, and Boron

Metallurgical grades of zirconium and titanium are available in good supply and as the shipping situation is gradually improving it is confidently expected that future peacetime requirements can easily be taken care of. The situation as regards columbium ore is about the same, although the possibility of a greatly increased consumption in some of the alloys to be used in high temperature applications makes it a little more difficult to predict with confidence the adequacy of future supplies. Boron is used to such a small extent that domestic resources are far in excess of any foreseeable demands.

Trends in the Light Metals

Wartime Expansion of Productive Capacities of Aluminum and Magnesium Industries Spurring Search for Increased Peacetime Uses of Their Products

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ALUMINUM and magnesium, the light-metal "twins," which, because of their essential roles in the construction of military aircraft, experienced tremendous increases in production and consumption during the past five years, have returned from the war and are now entering upon their period of readjustment to "civilian life." From early 1941 until the surrender of Japan in August, 1945, most of the familiar products built of these metals were missing from civilian markets owing to the astronomical requirements of the aircraft program and the other demands of the armed forces. Only essential civilian requirements were met, and metal allocated for civilian uses by the Federal agencies controlling supply was small indeed in relation to demand.

Productive Capacity of Aluminum Industry Expanded Sevenfold

Wartime productive capacity of the aluminum industry was expanded sevenfold from 1939 to 1943 and was able to satisfy all military and essential civilian demands as well as large foreign commitments under Lend Lease. Actually, the installed capacity of the industry was not completely utilized even in late 1943, when peak production was attained, owing primarily to the stringency of the labor supply. Output of primary metal climbed rapidly from 163,000 short tons in 1939, to 920,000 in 1943; but in early 1944 when the supply of aluminum began to outstrip demand and stocks grew, operations were cut back, first at the Government-owned plants and later at some of the privately owned plants. Cut-backs continued through 1944 and, with the exception of a slight upswing in production early in the year, to the end of October, 1945, when all Government-owned primary aluminum and alumina plants (except the semicommercial alumina plants using domestic raw materials other than bauxite) were closed. As a result of these cut-backs, output in 1945 fell to an estimated 500,000 tons of primary aluminum.

Postwar Prospects Studied

The realization that even full wartime demand, a large portion of which was channeled into aircraft manufacture, did not require the use of all aluminum-producing facilities has stimulated a considerable amount of thought about the prospects of the industry in the postwar years. The Surplus Property Administration, the Department of Justice, and the Small Business Committee of the Senate, to mention a few organizations, have conducted studies designed to find a solution to the problem of maintaining a high degree of production and employment in the industry, as directed in the Surplus Property Act and the War Mobilization and Reconversion Act. In addition, a great deal of sales promotion and consumer research has been done by those in industry to find new and increased markets for aluminum. The consensus seems to be that industry is entering what might be known as the "Light Metal Age" and that large increases in the use of aluminum are destined to come about in the future. However, most experts agree that this will not take place in a year or two but will be accomplished more gradually.

Reports of the Surplus Property Administrator, the Department of Justice, and the Senate Small Business Committee all conclude that competition in the production of aluminum is desirable and maintain that such competition will tend to lower prices and promote wider acceptance of the metal. The Department of Justice report to Congress takes the attitude that it is virtually impossible to find industrial organizations willing to start from scratch to compete with

Screening tower at magnesium quarry

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the Aluminum Co. of America and that therefore it may be best to break Alcoa up into several competing units. The Surplus Property Board takes the stand that competition can be fostered only by Government subsidy in the form of favorable leases, aid in raw material supply, and assurance of a market to prospective newcomers.

Such drastic steps to foster competition in the aluminum industry may be the only answer to disposition of the Government-owned aluminum facilities, if the establishment of competition through Government efforts is accepted as a necessity. However, it is apparently overlooked by some that a competitor already exists in the aluminum industry—the Reynolds Metals Company, which now owns 17 per cent of the private reduction capacity. The Reynolds Metals Company has recently offered to lease the Hurrican Creek alumina and the Jones Mill reduction plants from the Reconstruction Finance Corporation, which has approved the offer. Thus, if this lease and an eventual purchase of the plants by Reynolds are carried out, the company will have over a fourth of the privately owned capacity for the production of primary metal.

Aluminum Co. of America offered to purchase the two Government-owned Bayer alumina plants and several of the reduction plants, but under a ruling by the Attorney General (whose approval is necessary in the sale of the Government plants) the disposal of any Government-owned aluminum plant to Alcoa would be a violation of the anti-trust laws, unless such disposal were accompanied by the relinquishment of properties now owned by Alcoa to the extent necessary to create competition. It appears, therefore, that no facilities for aluminum production will be sold to Alcoa, even if no other purchasers can be found unless: (1) The company is split into separate competing units, several of which might buy plants, or (2) Congress should pass legislation to exempt Alcoa from the antitrust laws.

Disposition of Surplus Metal Stocks a Problem

The disposition of the large surplus stocks of metal in ingot, semifabricated, and fabricated form held by Government agencies and private companies is an important consideration in predicting primary metal production for the next few years. Stocks on hand, including metal at aircraft plants and other consuming plants, operated at high levels during the war, metal in the hands of scrap dealers, in plant inventories, and in process in the aluminum industry, and on Government stock piles probably totaled over 1,000,000 short tons at the end of 1945. In addition, large quantities of scrap are expected to be returned in the form of wrecked and surplus aircraft. Dumping any substantial part of this metal on the market would cause serious hardship to the aluminum-production industry. At present Government-owned metal is being held under the freezing provisions of section 22 of the Surplus Property Act of 1944, which provisions have recently been extended from January 3, 1946, to April 1, 1946. Several stock-piling bills were under consideration by Congress at the end of 1945 and would provide for holding a large share of the available stocks as a strategic reserve for protection against any future emergency. Legislation of this type, if provided with proper safeguards, will help insure that the aluminum industry during the reconversion period would not have a Damoclean sword of Government-owned aluminum hanging over its head and will insure a quicker return to a normal situation of balanced supply and demand.

Aluminum Prices

Aluminum, now quoted at 15 cents a pound for ingot and 14 cents for pig, is unique among the major metals in that its price has been lowered 25 per cent since 1939. After full civilian production is resumed and economic conditions are more normal, further reductions in price may occur, although they do not appear to be likely in the immediate future, especially in view of current labor disputes involving higher wages. One certainty with regard to cost is that aluminum has been considerably improved in relation to other metals during the war and that most, if not all, of this relative gain can be held. Available data indicate that perhaps all of the privately owned production capacity can produce metal profitably at the present price under present conditions and that possibly as much as half of the large Government-owned capacity could meet present prices if demand warranted full operation.

Consumer Demands Heavy

Consumption of aluminum and aluminum products in the immediate postwar years probably will be relatively large in those industries that have a large accumulated demand, such as cooking utensils and other small consumer items, although total consumption of the metal will drop sharply below the war level owing to the large decrease in airplane construction since the end of the war. After the immediate readjustment and reconversion period, consumption of aluminum will increase in the heavy industries, including building construction, railroad rolling stock, and truck, bus, and possibly automobile manufacture. Resumption of civilian plane output, expected to be increased greatly over the prewar period, also will require aluminum. A steady demand for a moderate number of military aircraft, if national policy should demand maintenance of a strong air force, would also be an important outlet. In addition, many new products resulting from knowledge gained in the wartime research on aluminum probably will appear on the market during the next few years.

Estimates of primary aluminum consumption by the fourth or fifth year after the war have varied widely and range from 250,000 tons to more than 700,000 tons, assuming a price of 15 cents a pound. At lower prices, of course, the use of aluminum would rise in products where its competitive position with other metals is very close. In certain industries, such as bus, railroad equipment, and aircraft manufacture, where light weight is a controlling factor, small price changes would have little effect on total use, since long-term operating costs are more important than first cost. In other industries, however, where first cost is a determining factor, such as the automobile, washing-machine, electrical appliance, and building-construction industries, the consumption of aluminum would be greatly affected by fluctuation in price.

The United States will continue to occupy an important position in the world aluminum industry after the war. Although it is doubtful that the domestic industry can compete favorably with certain countries, notably Canada, in the world ingot market, it seems relatively certain that with American mass-production techniques and low unit cost of fabricated products, articles made from aluminum, such as cooking utensils and other items, as well as semifinished forms, such as sheet, rod, and bar, can compete to advantage in many foreign markets.

Magnesium Production Up

Capacity to produce magnesium shot upward at an extremely rapid rate during the period from 1940 to 1944; its rate of growth during the emergency period far outdistanced that of aluminum. From a relatively minor industry with an output of about 3,500 short tons in 1939, magnesium rapidly burgeoned into a 293,000-ton (rated annual capacity) industry. In the peak year 1943, production reached its wartime ceiling of 183,584 tons. Cutbacks instituted during 1944, when stocks began to grow rapidly, caused a decline to 157,100 tons in 1944; and in 1945 output sank to its lowest point in four years with an estimated output of only 33,500 tons. By the end of 1945 all 13 Government-owned plants had been closed and the Dow Chemical Co. remained, as before 1941, the only domestic producer of magnesium. The only other private company in the field during the war, Permanente Metals Corporation, at Per-

manente, Calif., was not operating its magnesium plant at the end of the year, although it is reported that high hopes are held for resumption of operations after plant changes, designed to reduce costs, are completed. It was recently announced that the $28,745,000 plant loan from RFC had been repaid in full by Permanente.

The outlook for the utilization of productive capacity is not nearly so encouraging for the magnesium industry for the next several years as in the aluminum industry. Late in 1944 and early in 1945 only 17 per cent of total plant capacity was in use even with a two-front war in progress and with no restrictions on civilian consumption. A survey of the wartime record leaves no doubt that magnesium was greatly overexpanded, even for war, but difficulty in predicting demand made this excusable, although unfortunate. At present, private plants alone, leaving the Government plants out of consideration, probably possess considerably more than enough capacity to supply demand for the next five years. To date no negotiations have been concluded for the sale of any of the Government plants, although some interest has been shown in several of them, chiefly as chemical producing units. The Surplus Property Administration recommended late in 1945 that six of the Government plants be kept in at least partial operation or retained in stand-by condition for national defense purposes and that the remaining seven be adapted to other uses where possible.

Research and Markets Need Attention

From a research and marketing standpoint magnesium has not kept up with its tremendously increased capacity, although notable advances in technology have been made during the past five years. Before the war magnesium, although recognized as a potential structural metal because of its light weight and high strength: weight ratio in alloy form, had not been widely accepted. Structural uses were growing, but pyrotechnic, alloying, and deoxidizing uses claimed a major portion of the output. Great improvements in mechanical properties, corrosion resistance, machining, and welding practice have resulted from war-time research but further research and correlation of present data as well as lower costs are necessary.

The price of magnesium has dropped sharply since 1939, falling from 30 cents to 20.5 cents a pound. At present, on a volume basis magnesium is cheaper than aluminum, although on a weight basis it is one-third more expensive. With improved technology of production there is no reason for believing that this downward price trend will be arrested at 20.5 cents. However, as with aluminum, the cost of magnesium in ingot form is not the decisive cost factor in using the metal in fabricated form. The costs of casting, rolling, forging, and extruding the metal determine to a larger extent its price to the consumer.

Postwar Outlook

Estimates of postwar consumption of magnesium have ranged from 10,000 to 250,000 tons annually. The latter figure seems almost ridiculously high unless intended for some period well in the future. The most reasonable estimates indicate a consumption of 20,000 to 30,000 tons a year by 1950, assuming that more or less normal business conditions prevail at that time. Owing to its light weight, magnesium should find new and expanded uses in fields where that property can be used to the fullest advantage, such as in truck bodies, railroad rolling stock, terminal freight facilities, less-than-carlot containers, airplanes, portable tools, and other items. Consumer goods such as portable mechanical dishwashers, wheelbarrows, lawnmowers and so forth, also offer possibilities for increased use of the metal, and in addition, chemical and alloying uses will offer a substantial market.

Owing to its light weight and the abundance of its ores, magnesium may well become one of the most important industrial metals of the future. When that time will arrive no one can say, but it does not seem likely within the next decade. Continuously advancing technology, greater consumer acquaintance with the metal, and probable lower costs appear to insure magnesium a promising ultimate future.

Antimony

Domestic Restrictions Hamper Production Despite Increasing Demands

By WORTHEN BRADLEY

President
Bradley Mining Co.

ANTIMONY as the subject of a review is a new effort for this writer, and he is grateful for data found in the notations (intended for this article) made by R. G. Hall before his untimely death, and for material supplied by James Bradley.

Supply and Demand

At this writing (January, 1946) antimony is scarce, and becoming scarcer. The war is over and demand for the oxide is down, but calls for the metal are mounting, at home and abroad. Domestic production is negligible, and imports are questionable. Bolivia and Mexico supplied much of our wartime requirements, but now the antimony output of at least one of those countries is being attracted toward the European market. This is not strange, when it is considered that the London price is 20c per lb., vs. the U. S. price of 15c. At the end of October, 1945, the U. S. Government stockpile was down to 2,089 tons of antimony metal. This is equivalent to about a two months' wartime supply, or about a four months' prewar supply.

To go back a few years, antimony was considered in an easy supply situation toward the end of 1943, and it was removed from governmental allocation on January 1, 1944. It was on the "free" list throughout 1944, but its position was becoming more critical toward the end of that year. A return to strict control under War Production Board Preference Order M-112 took effect on March 14, 1945 (as finally amended). This control continues, having to do chiefly with limitation of inventories.

One of the incidental features of the Preference Order is the limitation to 9 per cent of the antimony content of grid metal in storage batteries. Most manufacturers would prefer a content of at least 12 per cent, as their machines are set up to handle the harder alloys. Some manufacturers have been forced to meet the problem by adding

more lead and producing a thicker battery plate.

In 1943 and 1944 uses of antimony were about evenly divided between the metal and the trioxide. Toward the end of 1944 the relative use of the "oxide" increased, and this trend carried over into 1945. The trend was not always clear, however, as the military buying program was somewhat confused. There were several cancellations and renewals, but early in 1945 the Army and Navy oxide program became more well defined, and the situation was recognized as critical.

Requirements of Sb_2O_3, chiefly for use in flameproofing materials (such as tents, camouflage nets, and gun covers), and in fire-retardant paints, were estimated at 2,500 tons per month. Much of the antimony metal in the Government stockpile was converted to oxide. In the summer of 1945 the Harshaw Chemical Company of Cleveland built a new oxide-producing plant at El Segundo, Calif. This plant can process several hundred tons of stibnite concentrates per month.

Demand for the oxide was thus mounting, right up to V-J Day. But after that there were at least two factors which caused a reversal of the trend. Army and Navy cancellations became the order of the day, and there was the matter of substitution. Zirconium has been gaining ground as a replacement for antimony trioxide in the enamelware field.

Thus, as we start 1946, antimony metal requirements again (as in pre-war days) increase their relative precedence over oxide requirements. The oxide is down for reasons noted above, and it is a question for the future whether the flameproofing and fire-retardant properties of the oxide will carry it over into civilian use. It would be interesting to learn, for instance, how much of the oxide might be used by Ringling Brothers and other such organizations in flame-proofing their circus and sideshow tents. We can at any rate hope that antimony will not often turn up in crematory ashes, as headlined recently by the San Francisco *Chronicle* (the accompanying news item referred to antimony as "a deadly sister of arsenic").

Demand for antimony metal is up because of several factors. The shortage factors: i.e., diminished production from domestic mines, conversion of stockpile metal during the oxide scare, and slowing up of imports, have been touched upon. The positive factor is the increased demand for the metal in hard lead, bearing alloys, type metals, cable covering, sheet and pipe ornamental castings, collapsible tubes and foil, small arms ammunition, and solder (arranged in order of importance, from information at hand).

Antimony Production

The Yellow Pine mine in Valley County, Idaho, accounted for 91 per cent of domestic antimony production in 1944. Yellow Pine's stibnite concentrates were a by-product of its tungsten operation, and that operation trailed off to zero at the end of 1945. Future antimony production from Yellow Pine will depend on that property's successful conversion to low-grade gold-antimony mining and milling, a program which is expected to start early in 1946. However, it is not anticipated that the antimony yield will be as great as that which accompanied the scheelite milling.

Primary crushing plant, installed during 1945 at the north rim of Yellow Pine Mine tungsten pit. Mining of low grade gold-antimony ore is expected to begin early in 1946 on the East Pit benches in the upper half of the picture

Total domestic production was down 20 per cent from 1943 to 1944 and, while the 1945 figures are not yet available, it is safe to say that the downward trend continued through that year. The Coeur d'Alene Mines Corp., of Idaho, was second in importance to Yellow Pine as a producer. There were still a few properties, in 1945, shipping stibnite concentrates as a major effort and not as a by-product. On the whole, however, it can be repeated that domestic production for 1946 has a negligible appearance.

Only some "shot in the arm," such as a higher domestic price, an adequate tariff, or lower freight rates from the western states, will cause any great revival of domestic antimony production. At this point it is worth noting that there is some export bidding for part of our small domestic production. Antimony metal and its compounds are under export control, but not its ore and concentrates. Europe must indeed be in need of antimony, as the London price of 20c would indicate.

Import Situation

Which offers a natural transition to the subject of imports. There was a drop of 42 per cent in antimony imports to this country, from 1943 to 1944, and again it is a good guess that this trend continued in 1945. Shipments from Bolivia fell off because of the stabilized U. S. price (vs. the attraction of a higher European price, as noted above), a tightening of U. S. grade specifications, and (for a time at least) a shortage of ships. There will probably always be antimony shipments from Mexico to the Laredo Smelter, because of the favorable freight rates. As for China, its unrest makes that former great producer at least months, and perhaps more than a year, away from any substantial resumption of antimony shipments.

To conclude, antimony demands are on the increase and domestic producers could share in the business, if given some practical encouragement.

Mining Congress Journal Index—1945

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Diesel powered shovels of ¾-yard capacity are used in this open pit quicksilver mine

★

By C. N. SCHUETTE
Mining Engineer
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★

Quicksilver

Domestic Outlook Clouded. Government Safeguards Necessary to Promote Development of Reserves

FOR the domestic quicksilver industry the year of 1945 was one of anomalies. Consumption of the metal reached record heights but the price went down. Production started up in anticipation of this increased demand and then it was practically impossible to sell the metal produced. The average annual price was about $135 per flask against $118 in 1944, but production dropped to about 31,000 as against 37,688 flasks in 1944. An American invention caused the increased demand but foreign quicksilver producers profited thereby. Not for decades has the domestic quicksilver industry been in better shape for ore reserves, both as to tonnage and grade of ore, but at the end of the year the industry was practically shut down.

Industry's Recent History Reviewed

To fully understand this curious situation, a short review of the recent history of the domestic industry will be helpful.

Through 1913 the United States produced more than enough quicksilver to satisfy domestic uses. During the first World War the greatly increased demand was also met by local mines despite labor shortages and greatly increased costs. Just after World War I, domestic mines were forced to close because floods of foreign metal from countries with greatly depreciated currencies took the market away from our producers. Our mines had gutted their reserves in the emergency and needed a breathing spell to recover and do needed development work. Tariff protection was sought in 1918 but was not granted until September, 1922, long after our mines had been forced to close. After receiving tariff protection our industry revived until in 1931 it again produced an exportable surplus above domestic needs.

U. S. QUICKSILVER PRODUCTION AND PRICE

Period	Years Inclusive	Production in Flasks	Weighted Average Annual Price/Flask
1. Pre World War I	1910-1914	103,682	$44.57
2. World War I	1915-1919	141,422	109.34
3. Depression of '21	1920-1924	44,128	67.56
4. Recovery and boom	1925-1929	69,496	113.38
5. Depression of '31	1930-1934	84,236	84.31
6. Pre World War II	1935-1939	87,219	84.48
7. World War II	1940-1944	222,773	177.43

The opposition to tariff protection came from a government agency which took a very pessimistic view of the future potentialities of the industry. The much quoted sentence, "It is doubtful whether there is any wisdom in attempting to foster quicksilver mining by a high import duty," * expresses the view held by the government agency at that time. There is no longer any doubt of the wisdom of fostering the quicksilver industry at that time, as it supplied all the metal needed in World War II also.

Government pessimism anent the industry continued through the years as exemplified by an argument advanced in 1937 † that upswings in price brought proportionately lesser increases in production and from ever lower grade of ore. Of course these dire forebodings were advanced by desk-job experts in Washington and were based on statistics. The interpretation of these statistics was undertaken in utter and complete ignorance of the many factors that affect the actual operation of mines. Furthermore it is suspected that the statistics quoted were selected to prove a preconceived notion.

Take for example the seven five-year periods of production shown in the table above. From period 1 to 2 a price increase of 145 per cent brought out a 35 per cent increase in production. From period 3 to 4, a price increase of 67 per cent brought out a 57 per cent increase in production. In periods 5 and 6 production and price were about the same. From period 6 to 7, a price increase of 110 per cent brought out a 156 per cent increase in production. Where is that specious argument of 1937 now?

These misconceptions anent our domestic quicksilver industry, however wrong, dominated the thinking in

* U. S. G. S. Bull. 666-FF 1919.
† U. S. B. M. Minerals Yearbook 1937.

Washington at the start of World War II when the Italian and Spanish supply of quicksilver was in enemy or unfriendly hands. To stimulate our "decadent" industry, a ceiling price of $191 f.o.b. Pacific Coast was placed on our production while Spanish cartel quicksilver was bought at prices giving Dictator Franco a *net profit* some $50 per flask greater than the ceiling price allowed to our own miners. Great efforts, at an as yet undisclosed cost to the American taxpayer, were made by our government to stimulate quicksilver mining in the rest of the Americas.

In the five war years of 1940-1944 inclusive, our mines produced 222,773 flasks and our consumption in the same period was 218,700 flasks, so that for all practical purposes all of the stockpile metal was foreign metal. Despite the Washington theorists, the quicksilver industry came through again.

On October 1, 1943, a meeting of the Mercury Advisory Committee was held in Washington, D. C. U. S. production in this month was 5,200 flasks and this rate of production, plus Canadian and Mexican production, promised an output of 108,000 flasks per year. Requirements were estimated at 60,000 flasks per year (i.e., equal to the domestic rate of production) so an overproduction of 48,000 flasks (of Canadian and Mexican metal) seemed imminent. It was hinted that the price would be cut to $160 to curb this excess ? production. At this gloomy stage of the meeting an army captain announced that the army had a new use for mercury (the tropical battery) that would need 2,000 flasks or perhaps several times this amount per month.

Despite foreknowledge of this increased demand, it was announced in December, 1943 that Metals Reserve contracts with our domestic mines would be canceled at the end of January while purchase contracts with many foreign producers continued for some six months more. As a direct result of this action, the domestic price started down, there was practically no market for six months and many of the mines closed down. Production dropped to 2,300 flasks per month. The larger operators hung on waiting for the increased demand to materialize and toward the end of 1944 there were signs of increased consumption and the price recovered moderately.

In 1945 the price increased to a high of $165 per flask in February and then declined as larger and larger imports were offered at lower and lower prices. Domestic production increased to a rate of 3,600 flasks per month in July and then dropped as there was no market for domestic metal and huge stocks of unsold metal piled up at the mines. Consumption reached a peak of 8,900 flasks in May when the European War ended and held up to August when the war in Japan was over and then dropped back to normal.

Over 51,000 flasks of foreign metal were sold in our market in 1945. With the end of the war a large part of this metal was tied up in contract cancellations and unless it is diverted into the stock pile, remains as a menace to our market. After having forced the domestic price down to $89 per flask and having taken the market away from domestic producers, Spanish importations stopped and Spanish metal was diverted to London where the price was raised to $120 per flask, while our producers were left to struggle with a dull glutted market where small lots could be sold at $100 per flask.

By October practically all the larger producers were shut down and some 10 smaller mines put out some 1,200 flasks per month.

At the end of the year the market was still dull but the price picked up a little as hope increased that the surplus metal would be taken into the stockpile and a few mines resumed at least partial operation.

Outlook For Domestic Industry

The short range outlook is uncertain for the domestic industry. Costs are nearly double those of pre-war days and the labor shortage is still severe. Some of the larger producers have reserves of ore and can resume production as soon as demand revives. Nearly all of the surviving mines have plans for exploration and development to be done as rapidly as labor becomes available. The uncertainties in the situation are the tariff, government policy, in general, the threat of foreign metal produced at low cost in countries of low living standards. Great damage from caved workings has already occurred at many of the closed mines.

The long range outlook for the domestic industry is better. World production and consumption of quicksilver is increasing as shown below.

These are average figures and it might be well to point out that for the five years of 1940 through 1944, world production of quicksilver was at the average annual rate of 211,558 flasks per year. The peak production year for all time was 1941 with a world output of over 265,500 flasks.

From	1500 to 1600.....	260,340 flasks or	2,600 flasks/year
	1600 to 1700.....	1,696,520 flasks or	17,000 flasks/year
	1700 to 1800.....	2,376,107 flasks or	24,000 flasks/year
	1800 to 1900.....	5,878,159 flasks or	60,000 flasks/year
	1900 to 1945.....	5,373,077 flasks or	119,500 flasks/year

Judging by the latest available data on world reserves of quicksilver ore and assuming only normal world consumption, a world shortage of quicksilver may well be at hand in less than 10 years time. Thereafter, higher prices must prevail to bring out the required production. In fact, such a trend toward higher world prices has been very evident for the last 30 years.

In view of increasing world consumption of quicksilver and the exhaustion of world reserves of high grade ore, the importance of our domestic industry is enhanced.

Government Safeguards Asked

In view of the solicitous attitude of our government toward foreign quicksilver producers, the domestic producer should be entitled to a bit of consideration also.

Tariff protection is justified by our higher standard of living, the annual pay of the Spanish or Italian miner being roughly equal to the monthly pay of our domestic miner. Tax relief should be granted to bring out venture capital for exploration and development. Government stockpiling seems justified, but the stockpiled metal should not be sold for less than it cost. The stockpile should be augmented by buying domestic metal only, at a fixed price to provide a floor for prices. Some method of preventing imports in excess of consumption requirements should be worked out by government to prevent the recurring economic waste entailed in the forced shutdowns of our mines because of such dumping.

A little applied common sense of this nature would serve to prevent us from becoming a "have-not" nation in respect to quicksilver.

No Reconversion Problems For Sulphur

By J. T. CLAIBORNE, JR.
Vice President
Freeport Sulphur Company

Production Facilities and Above-Ground Stocks are Ready to Meet All Demands from American Industry

SULPHUR-CONSUMING industries, manufacturing such peacetime basics as rubber, steel, rayon, petroleum, paper and fertilizer, may count on plenty of American sulphur in 1946 as they look forward to full civilian production.

Gulf Coast sulphur mines, which supply the major portion of this country's sulphur, after five war years of intensive production and record shipments have today production facilities and stocks sufficient to take care of all anticipated demands.

From Pearl Harbor to V-J Day, some 12,441,736 long tons of sulphur were shipped from Gulf Coast mines—more than 3,000,000 long tons over total shipments in the five years previous to 1941. Unlike this country's supplies of many other vital minerals, stocks of sulphur during the war were sufficient to eliminate any threat of shortage. There were no priorities placed on sulphur and prices have remained at prewar levels.

Service As Usual

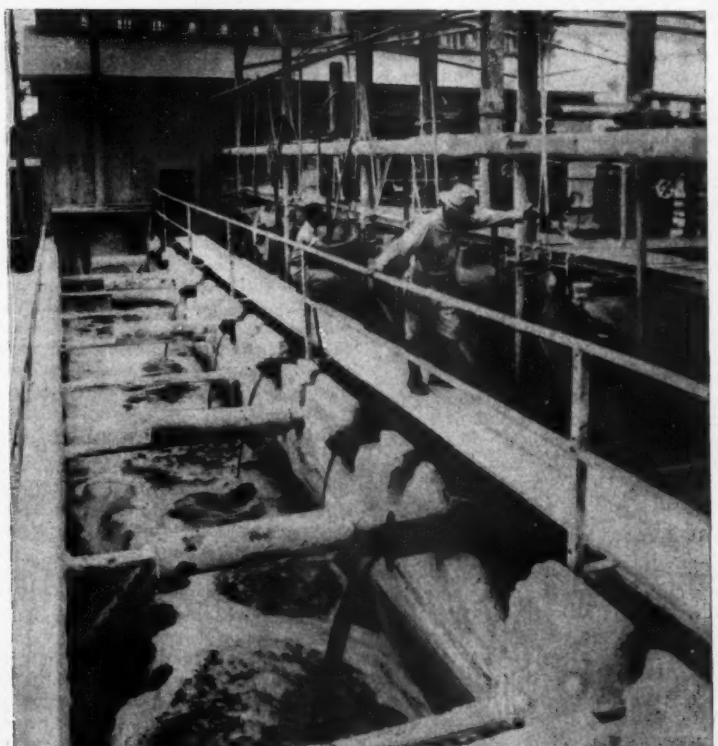
The drain of the record wartime shipments was balanced by high production, which climbed to new records in each successive year. In 1945 more sulphur was produced than in any previous year in the history of the industry, approximately 3,750,000 long tons. Stocks on hand at the mines at the end of 1945 amounted to around 3,500,000 long tons.

Thus, with stocks at comfortable levels, with the manpower situation easing as servicemen return to their jobs, and with no reconversion problems, the sulphur industry is in a good position to continue "service as usual" to American manufacturers.

Indications are that sulphur consumption will continue high in 1946, providing there is no general industrial let-down. The reserve of civilian orders accumulated during the war, and new developments, based on war discoveries, will keep many peacetime sulphur consuming industries from shrinking to prewar size. Others, prevented from normal growth during the past five years, already show signs of making up for lost time.

Sulphuric Acid Production

Significant in the postwar picture of the sulphur market is the fact that, although the largest proportion of sulphur shipments during the war went into the manufacture of explosives, in the form of sulphuric acid, this does not mean a corresponding



Molten sulphur pumped from 1,000 to 1,600 feet below the surface of the earth is metered at this relay station before being piped to the storage vats where it will cool and solidify

drop in consumption with the closing of explosives plants.

In order to meet war needs, the country's sulphuric acid production capacity jumped more than 2,000,000 short tons to a total of 10,500,000 short tons, 100 per cent acid. However, undue expansion of the industry has been avoided by a well-organized system of salvage and reuse of the acid first employed in explosives plants. This acid will now be sent directly to peacetime industries as a fresh product instead of being routed first through the explosives plants.

Sulphur for Agriculture

Outstanding among peacetime sulphur consumers will be the fertilizer industry which will have an important part in helping the country reach maximum crop production. Civilian and export food demands are expected to rise sharply, taking up the slack provided by military reductions. Food supplies must also be kept moving to our occupation armies abroad, and, according to Government estimates, some 8 to 10 per cent of our total food production in 1946 will be allocated for overseas peoples who must be dependent upon us until their farms have been reconditioned.

To meet the demands of the food industry, farmers must obtain top yields from their fields, and reports from the fertilizer industry indicate that demands from farm areas are increasing by as much as 100 to 367 per cent over prewar years. National production capacity for superphosphates is around 10,930,000 tons although war limitations have held this to about 6,000,000 tons in 1945. Estimates based on statistics from the Chemicals Bureau of the War Production Board set use of sulphuric acid by the fertilizer industry in 1946 around 4,000,000 tons (50 per cent Baume).

The insecticide and fungicide industries, though, of course, very much smaller consumers of sulphur than the fertilizer industry, will play their part along with the latter in building up American food stocks. Sulphur is a basic ingredient for most commercial fungicides, and, as a result of recent successful experiments, dusts and sprays combining the qualities of sulphur and DDT are now being launched.

Pulp and Paper

Another of the industries held in check by the war is the pulp and paper trade which is already showing signs of great postwar vitality. One of the big sulphur consumers, this industry annually takes more than 10 per cent of the total sulphur production. From 200 to 300 lbs. of sulphur are used for every ton of sulphite paper pulp and the average prewar consumption of sulphur by the industry reached about 354,000 tons annually. Additional sulphur is also used in producing a synthetic salt cake for the Kraft process and in bleaching and coloring paper. An interesting—even if tonnage-wise not very important—new use for sulphur in the paper industry appears to lie in the new bisulphate process for counteracting stream pollution. This process, which has met with much success, treats the waste liquor, formerly dumped, to recover useful chemicals and to evaporate unusable liquor.

Sulphur from Gulf Coast wells is loaded on barges at a river port

Synthetic and Natural Rubber

In the rubber industry, sulphur continues to play a variety of roles; whether in the vulcanization of both the natural and synthetic products, or whether as sulphuric acid. The rubber industry predicts a 66 per cent increase in consumer goods over 1939, to achieve an output of about 1,400,000 tons in 1946. Of the raw rubber to be processed in 1946, about 300,000 tons will probably be natural and the remainder synthetic. The fact that the industry estimates that nearly 66,000,000 tires for passenger cars will be rolling into the market, in turn throws the spotlight on the rayon industry, another large sulphuric acid consumer, which supplies cord for tires. The synthetic textile future seems promising for 1946.

Petroleum Industry

Sulphuric acid is one of the requisite ingredients for the production of high octane gasoline. During the war, large plant capacities were developed to satisfy the immense aviation requirements. Part of this capacity is now engaged in improving motor car fuels and shows every indication of coming into routine use for this purpose.

Of interest in the field of sulphur lubricants for high speed engines required to work at high pressure and low temperatures is the development of a whole new series of sulphurized oil lubricants.

Sulphur for Steel

The steel industry will continue to be an important user of sulphuric acid for pickling purposes. In particular, for instance, civilian steel demands are likely to boost the output of sheet steel which, because of specialized treatment during its manufacture, consumes more sulphuric acid in the pickling process.

The Chemical Industry

The chemical industry has always depended upon sulphuric acid as one of its principal tools. Announcements from the industry for 1946 stress research in many hither-to untouched fields, point out markets for war developed plastics, synthetic fibers and other chemical raw materials unheard of in pre-Pearl Harbor days. Plant expansion expenditures by the chemical industry are expected to be over $200,000,000 in the next three years. In addition, several new and large markets are indicated for the rayon and cellulose film industries, also sulphuric acid consumers.

Among the technological developments of 1945 has been the discovery of a new group of sulphur drugs, the sulphamyldibromo-anilids, which are effective against strains of bacteria resistant to other drugs.

Sulphur continues to be a basic necessity of American industry in war or peace. So closely do sulphur shipments follow the curve of industrial activity, that it is known as the "barometer" of industry. At the opening of the first peace year since 1939, the sulphur industry is fortunate in being able to bring to the service of peacetime assembly lines, the same reliability of supply which marked prewar days and which won successive Army-Navy "E" awards during the last five years.

Potash and Phosphate—

Production of Both Potash and Phosphate Maintained at High Rate in 1945—Potash Industry Registers Gain in Research and Machinery Use—Phosphate Industry Studying Increased Metallurgical Efficiencies

POTASH

By J. A. BARR
Chief Engineer
International Minerals & Chemical Corp.

NO NEW sources or production of potash of any practical magnitude have been developed during the year. The main producers are American Potash Company, Potash Company of America, International Minerals and Chemical Corporation, United States Potash Company, and Bonnieville Ltd.

Production increased over the 1944 output to a maximum possible due to better metallurgical efficiencies, greater mechanization, underground and increased refining facilities.

The Government completed an intensive drilling program east of Carlsbad, N. Mex., and outlined a fair size area of sylvinite (KC1 NaC1) ore near the Getty oil pool, all in potash reserve area, withdrawn from public entry.

The private companies in the Carlsbad area conducted active diamond drilling program for proving up known areas and in the case of International Minerals and Chemical Corporation, the outlining of a new and important ore body.

Drilling was discontinued in the area south of Salt Lake, Utah, where Carnallite and Sylvite was found in a deep folded and faulted deposit which appears to have future economic promise.

Further research and test production of potash salts and alumina from Alumite was practically discontinued. This was a revival of a World War I project which could not hurdle economic barriers, as was the case with the potash brines of Nebraska lakes.

The International Minerals and Chemical Corporation put in improved and larger rubber-tired haulage equipment underground and practically completed an extensive test program on the use of Kennemetal alloy bits on rotary drills and undercutters, resulting in much longer life and reduced costs.

The research division of the company carried out an extensive program of work on potash chemicals and other process developments in cooperation with the development department, which resulted in increased mill recoveries and improved flotation machine design.

The Potash Company of America at Carlsbad is trying out new undercutters mounted on rubber tires; also a drill jumbo.

The United States Potash Company (1) reports two major developments in their Carlsbad operations.

At the mine a substantial addition of trackless mining equipment was made. This included large sized Joy shuttle cars, mounted on rubber, and having a load capacity of 12 tons and capable of handling mine run ore even up to slabs weighing as much as 2,000 lb.

The mine floor, normally rough and sharp edges from the undercutter pattern, is graded into smooth shuttle car travel ways by use of dampened cuttings which pack into a very firm surface.

Joy loaders, caterpillar mounted, were installed in the trackless mining areas with elevators and auxiliary equipment, including battery trucks to handle supplies. Power is delivered to the Joy loaders by cable; shuttle cars are of the cable reel type.

At the refinery, situated on the Pecos River about 13 miles south from the mine, an extensive construction program was completed in 1945. This included an increase in steam generating capacity and the installation of a General Electric bleeder type turbo-generator.

The new continuous cycle dissolving system replaced the earlier batch dissolving system for the separation

of potassium chloride from sodium chloride by differential crystallization.

The new dissolving plant includes Dorr thickeners and classifiers; a rapid solution is effected in turbo-mixers. Additional cooling equipment has been added, as well as Oliver filter capacity, so that a balanced, fully continuous operation is now in effect.

The American Potash Company is providing a substantial increase in their research facilities at Trona, where a new and enlarged program has been laid out to work on the many and complex processes so admirably handled and developed over the years to produce potash, borax, and other salts from a very complex brine.

There was a record production of potash by the five leading companies during the year of June, 1944, to May, 1945, of 767,881 (3) tons* of K_2O, an increase of 99,060 (3) tons or 16.7 per cent over the previous year.

The 60 per cent Muriate (KCl) was the leading grade, comprising 78 per cent (2) of the agricultural potash, followed by the 50 per cent grade Muriate and sulphate of potash, comprising about 8 per cent of the tonnage, then manure salts about 6 per cent.

The deliveries of chemical grades by the same companies were 85,684 tons of muriate and 2,852 tons of sulphate basis K_2O.

Foreign Potash Situation

The rather meager reports available indicate that the Polish mines are flooded and will require a very long time to rehabilitate.

The German and French mines are not too badly damaged, though considerable repairs and development will be required to overcome ruthless exploitation by the Germans during the war.

The transportation situation and condition is the real limiting factor to full-scale production, and it is estimated that a year or two will be required to reach normal operations. The depleted soils of Europe will need all the possible output during the restoration period.

The Spanish mines likewise depend on the restoration of transportation and domestic stability.

The Russians remain, as always, an unknown though they could be a factor in the export market.

It appears that all in all there will be two years or more of heavy production and demand ahead for our domestic producers.

Potash Chemicals[3]

War demands for all potash chemicals were extremely heavy, but there was also a normal increasing use of caustic, carbonate and permanganate of potash. The demand for chlorate is still above normal on operating plants due to a strike at one of the producers' plants and sudden relaxing of Government controls.

Next year will probably see a temporary dip in caustic consumption and to a lesser degree, carbonate, but in the over-all picture there should be a healthy upward trend in demand.

There was a tremendous increase in perchlorate capacity during the war for jet propulsion and military use which shut off rapidly after V-J Day. The future of this chemical is uncertain except for existing peacetime uses.

* Includes both sulphate of potash and sulphate of potash magnesia.

Mining methods and equipment are similar to those used in coal mines

PHOSPHATE

PRODUCTION was kept at the maximum possible by all producers, mostly from existing or replacement facilities and mines, aided by new equipment and process improvement. There was a nominal increase over last years' record output.

All the companies are active in post-war planning to provide greater production from new installations and better metallurgical efficiencies, the latter ranging from 15 to 30 per cent in recoveries (by beneficiation) during the last two years.

Western Phosphates

The Anaconda Copper Company is the largest producer from a well equipped and developed underground mine at Conda, Idaho, where production was maintained at the maximum possible, limited by war time shortage of material and labor. The mine output is crushed and dried before shipment.

The Mountain Copper Company was actively engaged in a novel side hill stripping proposition near Montpelier, Idaho, a comparatively new operation. The production was going mostly to the West Coast at San Francisco.

International Minerals & Chemical Corporation (4) continued its exploration and development program just south of Drummond, Mont., with some test shipments from the pilot mill at Sherryl.

The Consolidated Mining and Smelting Company of Trail, B. C., operated at full capacity in several mines near Garrison, Mont., with shipments of "mine-run" to their phosphoric acid plant at Trail, B. C.

The production for the first half of 1945 was 62,220 long tons and 55,209 tons respectively for Idaho and Montana, as compared with 58,163 and 80,239 tons for the same period last year (5).

There are very few western phosphate deposits that can be readily developed into present day competitive-cost, substantial-tonnage output, ship-

ping grade propositions. The ruling factors are: distance from rail transportation with consequent expense of access; types of ore that are too low grade or cannot be practically beneficiated; distance from cheap power. The total tonnages are large and the reserves for the future are assured.

Tennessee

There were no new mine or plant installations during the year, though production was kept at a maximum possible with conditions, with the aid of some new and more modern equipment such as the replacement of the old steam dragline excavators by mobile and high-speed diesel machines.

Truck haulage has mostly replaced steam locomotive and train line transportation from mines to washers and plants as the larger block deposits have been mined out, leaving the smaller and scattered areas. A few large deposits are being held for future reserves and operations.

The production for the first half of 1945 was 682,670 tons (5) as compared with the same period in 1944, of 620,584 tons, including a small apatite production in Virginia.

Practically all the Tennessee production was from the so-called "brown rock," a sandy, clay phosphate matrix resulting from the breakdown of phosphatic limestone by ground water leaching.

Some of the matrix is used directly in electric furnaces after nodulizing or sintering; some is beneficiated by pugging in log washers followed by screening and classification to separate from the clayey fraction.

Part of the washed phosphate is used in the electric furnace as well as the wet sulphuric acid process for the manufacture of phosphorus and phosphoric acid. The larger proportion of washed phosphate is used in the manufacture of superphosphate for the fertilizer trade.

The nominal grade of furnace phosphate is 55 per cent B. P. L.,* and that for the manufacture of superphosphate now averages 70 per cent B. P. L.

Florida (Pebble District)

There was an increase in production in the Pebble District, which lies in Polk and Hillsborough Counties, due to some new facilities and improvements in plants and metallurgy.

The demand for phosphate was very heavy and exceeded the available production.

The companies are all actively engaged in post-war planning, and several projects are either under construction or in the design stage, which will result in a much needed increase in capacity, and also replace some mines which have mined out their economically adjacent territory.

No new mining methods were introduced during the year, though excavation of the matrix by electric dragline before hydraulic transport to the washer plant continued to gain favor. The benefits over straight hydraulic mining are: lower power costs and better operating conditions by removal of the expensive and heavy pumping equipment from muddy pit bottoms to a more stable surface at pit side.

The trend in excavating equipment is toward bigger and larger range electric walking type draglines. Starting with 5-yd. caterpillar or truck mounted machines in the twenties, we now find 12- and 15-yd. machines all topped by a 20-yd. walker type dragline recently placed in operation by the International Minerals & Chemical Corporation.

Flotation continues the dominant factor, and it can be said that most of the deposits left or now being mined could not be practically operated without this process.

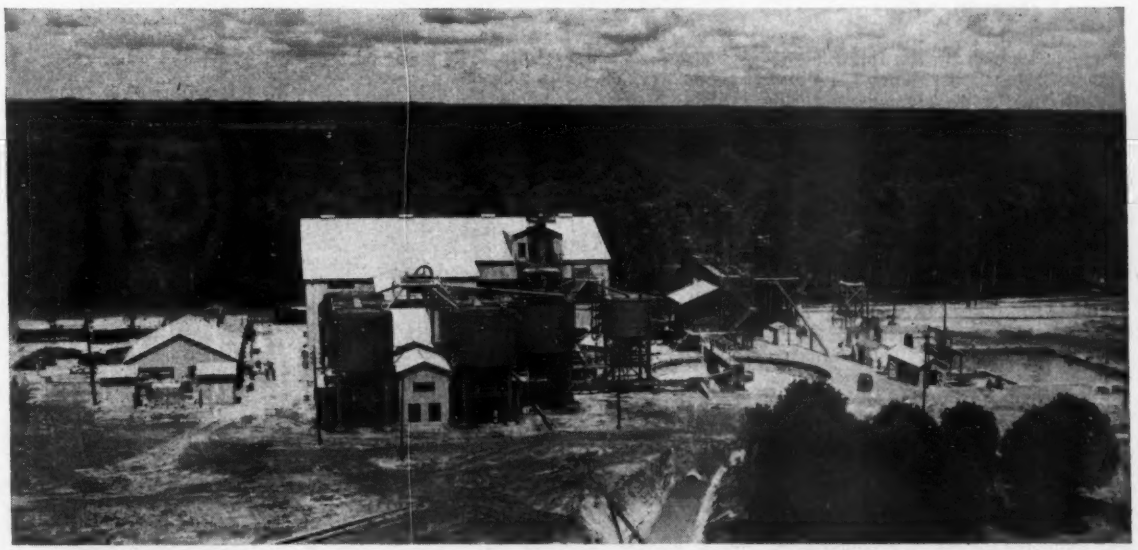
Flotation research on phosphate was started in Tennessee in 1927 (7) followed by a pilot plant the same year and a full scale operation in 1930 by International Minerals & Chemical Corporation.

The Phosphate Mining Company, now a part of the Virginia-Carolina Chemical Corporation, built a new washer at Homeland with a capacity of 600 tons per day and has a 1,400 ton per day output flotation plant under design and construction at the new washer site.

The Southern Phosphate Company (9) has constructed a new washer and tabling plant at Bonny Lake served by a new mining operation, including a 7½- to 10-yd. walking type dragline with a 200- or 160-ft. boom length, according to size of bucket used.

They are currently moving one of their mining and beneficiating operations to a new territory near Lakeland and have installed a Raymond pulverizer at their central plant at Ridgewood for producing finely ground phosphate for direct application to the soil. They contemplate increas-

* Trade term—Bone phosphate of lime or P_2O_5 content calculated as tri-calcium phosphate.



Peace Valley phosphate washer and flotation plant

ing their production to 800,000 tons for 1946.

International Minerals & Chemical Corporation (4) increased both the efficiency and capacity of their Peace Valley mine and plant during the year with added equipment, larger settling areas, improved flow sheet and operating technique.

The American Agricultural Chemical Corporation has built a new washer near Boyette in Hillsborough County, and Swift and Company is constructing a new mine, washer and flotation plant near Fort Meade.

Hard Rock District (Citrus County)

The Buttgenbach and C and J Camp Phosphate Companies (6) built a new mine, washer and agglomerating tabling operation six miles south of Dunnellon. The capacity is 85,000 to 90,000 tons per year of 79 per cent to 80 per cent B.P.L. with 1.5 to 1.6 I&A,† supplemented by a lower grade 72/74 per cent table product. A Raymond pulverizer was also installed with a capacity of 8/9 tons per hour. The output was shipped mainly lend-lease through the drying and loading plant at Fernandina.

The Florida production (5) for January-June periods of 1944 and 1945 were as follows:

	1944 tons	1945 tons
Land pebble....	1,876,080	1,789,796
Soft rock.....	34,705	36,274
Hard rock.....	12,830	3,500
	1,923,615	1,829,570

Heat Metallurgy

Progress in this branch of phosphate is typified by the following resume of some of the Tennessee Valley Authority (7) developments during the year:

Defluorination of phosphate rock is being successfully accomplished in full-scale operations at Godwin, Tenn., by a fusion process developed after many years of research and pilot-plant operation at the TVA laboratories at Wilson Dam, Ala. The fusion is carried out in shaft furnaces fired by oil burners and charged with lump or pebble rock phosphate or agglomerated phosphate fines. The plant has two furnaces, each having a designed daily capacity of 60 tons of fused tricalcium phosphate, which are being operated alternately to permit improvements as experimentation proceeds. The product contains 28 to 30 per cent P_2O_5 and less than 0.3 per cent fluorine. Material containing 0.10 per cent fluorine can be produced also.

† Iron and alumina oxides.

Extensive tests of fused tricalcium phosphate as both fertilizer and stock-feed supplement have been made. A high degree of P_2O_5 availability to plant growth was shown by product containing under 0.4 per cent fluorine, and animal-feed tests showed that product containing less than 0.10 per cent fluorine gave results comparable to those obtained with bone meal.

All design innovations from years of experience were incorporated in a new 13,000-kw. phosphate reducing furnace and phosphorus condensing system at Wilson Dam. Construction of the furnace was started during the war at the request of the War Production Board. Notable in its construction is recently designed, monolithic, catenary roof. Cast from lumnite cement and firebrick grog, no steelwork is used in the roof. This improves the power factor and permits a more uniform feeding of charge. The furnace crucible is deeper than any hitherto built by TVA.

An important innovation was the operation of a phosphorus burner constructed of graphite, externally cooled with water. The burner is followed by a shell-and-tube type acid cooler also constructed of graphite. The new type burner reduced the high maintenance costs experienced in previous acid plant operation and improved the recovery of acid, and it constitutes an important advance in the art of producing phosphoric acid.

The development of a continuous type mixer for the production of triple superphosphate was completed and all superphosphate made by TVA is now being produced by this method. The mixer is extremely simple in design and contains no moving parts.

Phosphate investigations studied by TVA on a pilot-plant scale include: (1) development of a method of producing calcined pellets or briquettes from phosphate sands at a comparatively low temperature to form an economical charge for phosphate processing furnaces; (2) investigation of a method for the accelerated curing of concentrated superphosphate; and (3) development of a process for the production of diammonium phosphate fertilizer.

General

Production of defluorinated phosphate was increased during the year and the demand exceedingly heavy for animal feed, supplement, to correct a growing diet deficiency.

International Minerals and Chemical Corporation was the largest producer from superphosphate calcined under high temperature conditions. Coronet Phosphate also produced a product defluorinated in a cement type kiln in Pennsylvania using added silica to effect the elimination of fluorine. The operations are being transferred to their Coronet, Fla., plant.

Phosphate Chemicals[3]

There was a marked increase in the use of the sodium phosphates for detergents, water treatment and to bolster the severe soap shortage. Tri- and penta-chlorides are showing a healthy growth, as well as the oxychlorides, for the manufacture of organo phosphates for plasticizers and plastics. There was a very healthy demand for P_2O_5 for the Hondry oil refining process.

Use of sulphide continues about the same for "strike anywhere" matches, but the demand for penta-sulphide shows a great increase as an anti-oxidant in lubricants.

Red phosphorous is in maximum demand for export to foreign match manufacturers. Elemental phosphorous was heavily used during the war for incendiaries and smoke shells, which severely restricted the flow in regular commercial channels.

Water white phosphoric acid was in heavy demand for soft drinks, penecillin and yeast culture.

Commercial grade of phosphoric acid produced by the wet, sulphuric method was used to maintain a maximum output of triple superphosphate limited only by the supply of sulphuric acid available after war demands and as spent acid from munition manufacture.

The same is true of regular superphosphate used in fertilizers. The production of this product reached maximum regardless of acid shortage and labor scarcity. The demand for fertilizers was very heavy and exceeded the supply.

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Nonmetallic Mineral Industries

Strong Market Forecast for Fertilizer Materials and For Nonmetallic Products Used in Construction

By OLIVER BOWLES
Chief
Nonmetal Economics Div.
Bureau of Mines

A Pennsylvania slate quarry 450 feet deep. Wire saws introduced the Bureau of Mines are in successful operation

THE objectives of industrial activity in the nonmetallic mineral industries have changed tremendously during 1945. Early in the year the demand was for more and more mica, quartz crystal, barite, graphite, lithium and strontium compounds, fluxing stone, lime and asbestos to assist in making or equipping implements of war. With termination of the conflict the call for munitions ceased; but the already strong demand for fertilizer materials was accelerated to promote an increase in food products, not only to satisfy our own deficiencies but to assist in keeping starvation from those in other lands suffering the ravages of war. It is probable that, for several years, the market for phosphate rock, potash, nitrates, agricultural lime and limestone will be strong.

Huge Construction Program Predicted

The construction industries which approached stagnation during the depression years were just beginning to recover when the war clouds broke. and thereafter few buildings or highways were constructed except those directly or indirectly connected with the war program. It is not surprising therefore that we are now confronted with the most gigantic backlog of unsatisfied demands for building construction that the Nation has ever experienced, even though none of our buildings or roads have suffered war damage. A billion dollars a year of expenditure is anticipated for Federal-aid highways, planned flood-control projects amount to more than 2½ billion dollars, and waterway-improvement projects total 2 billion dollars. A million new homes a year will be needed for several years, and extensive construction of public buildings of every sort is in prospect. To implement this huge program is an important part of the reconversion program, but its bottlenecks are not retooling and redesigning; the primary limiting factors are availability of materials and labor, wage levels and prices. The period that will be required for the construction industries to attain anticipated momentum is problematical at this time because of unsettled conditions of labor and industry.

Most of the war-stimulated industries will doubtless experience declines in 1946, although new or enlarged peace-time outlets will compensate these losses to some extent. The mineral industries producing construction materials, namely stone, sand and gravel, cement, lime, gypsum, insulating materials and slate, have in prospect a definite uptrend in demand, but the growth in its volume will depend upon the speed with which the construction industries can reach the contract stage and can function effectively.

Space restrictions permit only brief reference to a few of the more interesting recent developments in the broad and diverse field of nonmetallics. An item of general interest is the appearance of a new grinding mill that has no moving parts. Softer minerals, such as graphite and mineral pigments, may be reduced in it to a particle size of 1 or 2 microns. The mineral product to be ground is carried in an air current through a very long pipe. Material near the axis of the pipe moves faster than that near the walls, and attrition is accomplished by this differential movement.

The following discussion of specific commodities covers representative developments in various fields.

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Cement and Its Aggregates

In this age of concrete construction new suggestions are constantly appearing for solving problems of manufacture and application of cement. Interest increases in air-entrained cements in highway construction because of their superior resistance to freezing and thawing. Much research has been devoted to them, and a definite conclusion has been reached on the effect of heat generated during clinker grinding on vinsol resin, one of the leading air-entraining agents. Tests at the National Bureau of Standards indicate that as much as two-thirds of the resin is volatilized above 300° F. Precautions should therefore be taken in grinding, because grinding temperatures may easily exceed that point. Some of the results of research are inconclusive and further investigation of air-entraining is desirable. An evidence of increasing recognition of its importance is the establishment of specifications for air-entrained cement by both the A.S.T.M. and the Federal Specifications Executive Committee.

Grouting railroad ballast is an outstanding new use for concrete. The cement mixture is applied through "grouting points" driven into the ballast several ft. apart and 5 or 6 ft. deep. Generally a hydraulic method is used whereby a lean concrete is forced into the ballast. Grouting increases the stability of water pockets and soft spots in road beds. At least 36 railroad companies are using the method.

For many years new pipe used in oil fields has been lined with cement, but the shortage of metal for manufacture of pipe during the war period has greatly stimulated application of the process to used pipe that otherwise would be discarded as scrap. Such use has been extensive in the oil fields of Illinois, Oklahoma, Kansas, and Texas.

All concrete construction requires aggregates, the most important being crushed stone, sand and gravel, and slag. The trend toward a larger use of the finer sizes continues. Some companies have found it necessary to add new equipment such as hydraulic classifiers. One company has introduced a hydro-separator to increase the recovery of minus 100-mesh sand, a larger percentage of which is now needed to meet new Federal and state specifications.

Lightweight aggregates that will reduce the load in concrete structures while retaining adequate strength are attaining greater prominence. The Department of Engineering Research of the University of Michigan, in collaboration with the War Production Board, has completed a study of cement-bonded lightweight aggregates. A great variety of materials were tested in combination with portland cement and a chemical admixture was designed to produce expansion on setting.

Perlite, a form of obsidian, occurring in Arizona, California and Nevada, has the peculiar property of expanding six or seven times its original volume when heat is applied. Several small plants are expanding it for aggregate in concrete and acoustic plaster.

A new method of multiple-hole blasting in large quarries producing crushed-stone aggregates has recently been introduced by the Atlas Powder Company. Where two or more rows of holes are shot as a single blast a short delay action in detonation of each successive row from front to back accomplishes more complete utilization and more effective performance of the explosive force. This method gives better fragmentation, reduces vibration and break-backs in the solid ledge, and improves shovel performance.

New Method of Punching Holes in Diamonds

A shortage of dies for fine-wire drawing was one of the serious bottlenecks early in the war. To drill a hole in a diamond, using a needle with diamond dust and oil, is a slow and tedious process, particularly for extremely small apertures. Under the spur of necessity the National Bureau of Standards devised an electric-arc method whereby a workman can drill a hole in a few hours that formerly required several weeks. The new process may be adapted also to diamond cleaving and facet cutting, hence the cost of fabricating cut diamonds may be materially reduced. Further research is in progress.

Versatile Silica

Homely silica sand, the unwelcome associate of spinach, abundant as barren dunes, waste seaside flats and sandstone ridges, is a versatile product that has many uses. The varieties of silica range from well-known building, paving and industrial sands to the gem amethyst and to pure quartz crystal, which proved to be a vital factor in war communications. Recently silica has acquired new interest because it is a basic constituent of the interesting group of silicones which are compounds of silica and carbon. They are important because of the remarkable constancy of their physical properties under extreme temperature changes. Ordinary sand is also the raw material for manufacture of silica gel recently used in making a drying agent that found important use during the war to keep moisture from injuring munitions during transit. Such "desiccated packaging" has wide applications in peace as well as in war.

Silica sand is also a major constituent of glass, a commodity that has vast potentialities for unique developments. A few years ago glass attained importance in the building trades for making glass-block windowless structures. Foamglass has found a place among the lightweight porous products and fiber glass combined with plastics is made into products useful in aircraft construction. They are said to have tensile strengths of over 80,000 lbs. per sq. in.

To advance the technology of glass making a Glass Science Research Foundation was established at State College, Pa., in 1944.

Alumina from Clay

The economic recovery of alumina from clay, a will-o'-the-wisp that has eluded investigators for the past 25 years, is still a popular subject for research. At least five separate programs are, or have recently been, in progress. The Ancor Corporation has completed a plant at Harleysville, S. C., for extraction by a lime-sinter, soda-leach process. Experimental runs are under way, but some operating difficulties have not yet been overcome. A demonstration plant was constructed

The largest granite quarry in New England—H. E. Fletcher Co., West Chelmsford, Mass.

at Salem, Oreg., in 1945 for recovery by an ammonium sulfate process. A shortage of ammonium sulfate has delayed operation. The Eastern Experiment Station of the Bureau of Mines, College Park, Md., has employed an alkaline (lime-soda sinter) process. The cost of extraction was lower with diaspore clay than with kaolin. The TVA has published the results of several years' work on a sulfuric acid process. The results were unpromising from the standpoint of costs. The National Bureau of Standards has been conducting pilot-plant tests using a hydrochloric acid process, but the results are not yet available. An overall analysis of accomplishments in the entire field of research on recovery of alumina from clay is desirable.

Nonmetallic Developments of Interest to Metallurgists

For postwar iron-furnace operation, when scrap will be plentiful, the addition of graphite to the charge is recommended. The use of all scrap and graphite shows considerable saving over the conventional pig-iron-and-scrap charge for certain types of furnaces. The advantages claimed for the addition of graphite are: Elimination of necessity for using high-priced, low-phosphorus iron, improved furnace-bottom maintenance, reduction in flux charge, and absence of foaming.

Laboratory and pilot-plant tests conducted by the Bureau of Mines have demonstrated that sillimanite discovered in South Carolina and Georgia can be concentrated economically by recognized mineral-dressing methods and that the concentrates can be made into superior high-temperature refractories that are resistant to vapors, fumes and slag corrosion. Extensive reserves of sillimanite-bearing rock have been found in a belt 30 miles wide and 250 miles long.

Zirconium oxide and silicate are expanding in usefulness in the production of porcelain having high resistance to thermal shock.

The substitution of non-metals for metals is sometimes an advantage. Granite rolls tooled to precise dimensions and highly polished are found to be superior to metal rolls employed in paper mills. Such rolls are not only hard and smooth; but, because of microscopic pores on the surface, the paper is less liable to stick than when metal rolls are used.

During the war, when there was little or no activity in erection of stone buildings, several stone-fabricating mill operators whose plants had been forced into idleness modified their equipment for metal working and made creditable records in the manufacture of war munitions. With the prospect of a coming boom in building, they are now reconverting their plants to their accustomed functions. However, in view of the depressed conditions in the building-stone industries for the past 14 years, it would not be surprising if some of these mill operators desired to continue their metal-working activities until a substantial market for building stone appeared.

Ankerite Gold Mines, Ltd., South Porcupine, Ontario, unable to secure imported flints, found that tourmaline which occurred in certain sections of the mine, could be substituted for flint as a grinding medium in tube mills. Grinding costs were, in fact, reduced a few cents a ton because of the high specific gravity and superior hardness of the tourmaline.

Mica Substitutes

Substitutes for mica in electrical equipment have long been sought, and some measure of success has lately been attained. Because of a shortage of mica during the war Germany developed a substitute having the trade name "Glushartgewebe." It consists of several layers of impregnated glass fabric bonded together under heat and pressure. The impregnating material is a homogeneous mixture of resinol, alcohol, and very finely divided kaolin. It was so successful for insulating commutator segments of motors and generators that its continued use was planned even though mica again became available.

It is claimed that "silastic," a new silicone rubber developed at the Mellon Institute, is a satisfactory substitute for mica in certain applications. Like other silicone products it is noteworthy for the constancy of its physical properties under extreme changes of temperature. It may be used as a coating on fiberglass or asbestos cloth, or it may be compressed to form gaskets, or extruded over electric wires.

Other substitutes for mica are newly developed high-frequency paper-dielectric capacitors for use in induction-heating equipment, and other high-frequency oscillator circuits. They are said to furnish economical service at lower cost than mica capacitors.

Feldspar Flotation

Flotation is finding important application in the feldspar industry. The Carolina Mineral Company began operating its new plant at Kona, N. C., in August, 1945. In the past most of the feldspar of commerce has been obtained from coarse-grained pegmatites by hand-sorting, but the rock used by this company is an alaskite, a pegmatite too fine-grained for hand-sorting. The rock is quarried in an open pit, loaded with power shovels, crushed, ground, and treated by flotation to produce feldspar, mica and quartz. As the finer-grained feldspar-bearing rocks are amenable to flotation the reserves of feldspar have, by introduction of this process, been extended very greatly. Other feldspar companies are using flotation successfully, and a much wider application of the process is in prospect.

Surplus Nitrate Plants

A large surplus plant capacity for the manufacture of synthetic nitrogen now exists as a result of the sudden halt in manufacture of military explosives. Of the nine Government-owned plants devoted to such work, one has already been acquired by the Bureau of Mines to be used as a demonstration plant for its work on recovery of gasoline from coal, and another has been assigned in part to the Reynolds Metal Co. The other Government-owned plants are for sale. An increasing demand for nitrogenous fertilizers may assist in some degree in solving the surplus-capacity problem.

War Salvage

A costly war has come to a close. The salvage of military supplies and equipment, while important at present, is, after all, a temporary problem; but there is another type of salvaging the effects of which reach into the future indefinitely. War necessities have stimulated intensive research and experimentation in many fields only a very few of which are recorded herein, and tremendous progress has been made in developing new products and new applications of minerals. Some of the advances may have purely military significance, but many of them have peacetime applications that will reduce costs, introduce new products, increase productivity and thus promote an over-all higher scale of living. While such technical evolution can compensate no more than a fraction of war losses, its effects are cumulative, and posterity only can evaluate the full influence upon our civilization of the constructive ideas that may be salvaged from the wreckage of war.

It Is Up to You

God gave us two ends, one to sit on and one to think with. It is up to you which end you use. Heads you win, tails you lose!

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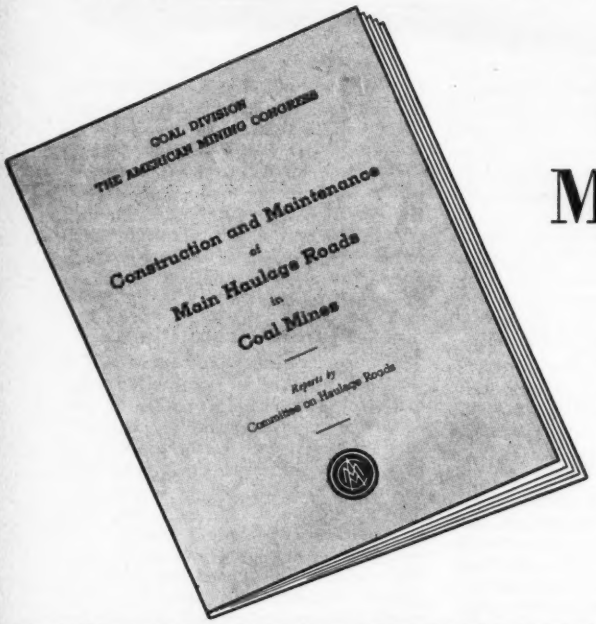

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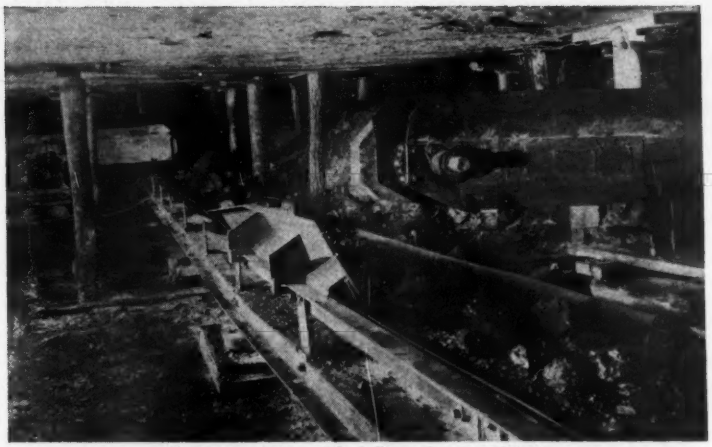

Conveyor mining with Jeffrey chains and belts

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By L. E. YOUNG
Mining Engineer

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Trends in Mechanical Mining of Bituminous Coal

A Comprehensive Discussion of Present Developments in Mining Methods, Together With Descriptions of Various Types of Equipment Designed For Productive and Auxiliary Operations

WHILE the production of bituminous coal in 1945 did not reach the total of the record-breaking year of 1944, the output was creditable, considering the labor supply, absenteeism, and strikes. Mr. John D. Battle, Executive Secretary of the National Coal Association, said recently, "American coal mines are now at the highest point of mechanical efficiency and plant capacity in the history of the industry."

The demand for coal and the drive to win the war did much to overcome some of the handicaps under which the coal industry labored. It is a well-recognized fact that during the war period technologic progress in the industry was checked by the inability of the manufacturers to redesign old machines and to bring out new models. Of course, some progress was made in improving the machinery used in mechanized mines, but this was relatively limited and, judging from the reports of manufacturers, it may be predicted that the year 1946 will witness the advent of a number of new designs of mechanical loading devices and auxiliary equipment.

The extensive use of American loading machines, conveyors, and cutting machines in European mines during the last two years has done much to acquaint American mining men with European mining practice and has also been helpful to American manufacturers in demonstrating how our mining equipment may be adapted to the severe conditions existing in some European coal districts. The technical journals have contained descriptions of European combined cutting-and-loading machines, designed for longwall mining and operated successfully under difficult conditions. Even though the Meco-Moore machine * and the German planer † may not appear to have application generally in the United States, the fundamental prin-

Track mounted Myers-Whaley loader

* *Mining Congress Journal*, November, 1945, p. 48.

† *Mechanization*, November, 1945, p. 92.

ciples of both machines deserve most serious study. With the exhausting of our shallow and thick coal seams, we shall ultimately find it necessary to mine coal under conditions somewhat comparable to those for which the above-mentioned machines were designed.

No radical changes in American equipment for underground bituminous mines have occurred in 1945 but considerable improvement has been made in more or less standard equipment and in the auxiliary equipment servicing the cutting and loading units. The modification of the wage agreements has put even greater value on the productive time of underground workers. Throughout the industry there is a recognition that high wage rates will continue and that time- and effort-saving methods and equipment must be used wherever possible.

The technologic training of hundreds of thousands of men in the armed forces and also in connection with the war effort will result, undoubtedly, in an increasing desire of the younger men of the coal fields to escape the hard labor of the old-fashioned coal mine. To attract labor to coal mines, it will be necessary to mechanize them completely, if possible, and clever young war-veterans may make substantial contributions in the development of better machines and more efficient methods.

Progress In 1945

A concise review of progress made in 1945 should emphasize not only the things that loom large quantitatively, but also should point out whatever appears to have significance, even though at the time it may not have general application.

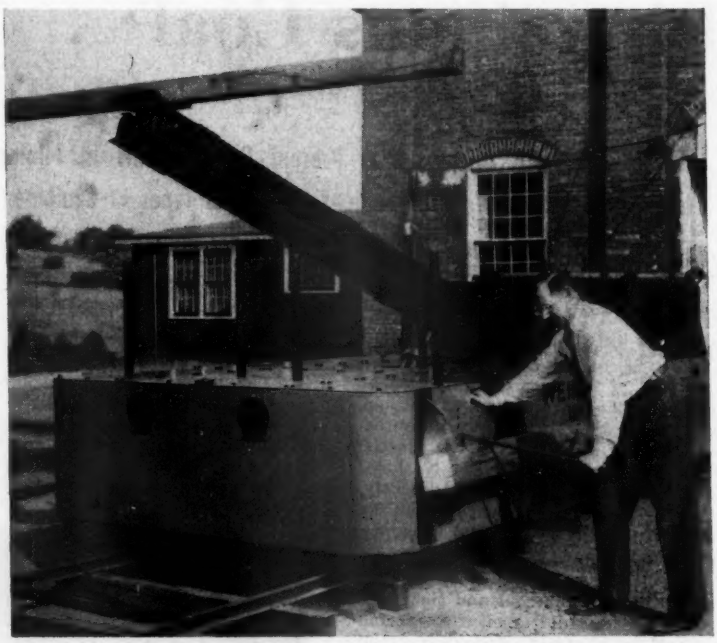
Due to the diverse seam conditions existing, there can be no one predominant and universal class of loading equipment. For flat seams of medium thickness and with good roof and floor conditions, several different types of equipment may be used effectively. In thick, flat seams, one type of equipment may predominate in one field; while in thin, flat seams there may be several different types, all giving satisfactory results, measured by such controlling factors as safety of men, production per man-hour, quality of product loaded, etc.

Commendable progress is being made in the application of mobile loading machines, duckbills, conveyors, and shuttle cars, with occasional successful applications of scrapers. Generalization in regard to developments in mechanized mining and any efforts to name the most significant contributions to progress in 1945 can achieve little practical benefit.

Considering the entire bituminous industry, among the items that have been receiving special attention in underground mines, or are deserving of mention, are the following:

1. Development and application of low-height equipment for thin seams.
2. Trackless mining (for sections of developed mines and new operations).
3. Increased capacity of loading and transporting equipment for medium and thick coal mines and better coordination of face preparation, loading, and transportation.
4. Both (a) efforts to produce cleaner coal in some mines (by eliminating impurities at the face), and in other mines, (b) high-speed mass-production with less concern about the loading of impurities (full-seam mining with enlarged cleaning plants).
5. In some mines, (a) limiting a production unit to one or two working places (to concentrate the work and avoid the moving of equipment, the

Shortwall undercutter by Sullivan



A track mounted timbering machine made at Weirton Coal Co.

crew consisting of a few men who serve in various capacities), and in other mines, (b) providing easily-moved cutting, drilling, and loading equipment operated by a staff of men, each of whom generally performs only one task.

6. Mechanizing and expediting auxiliary operations.

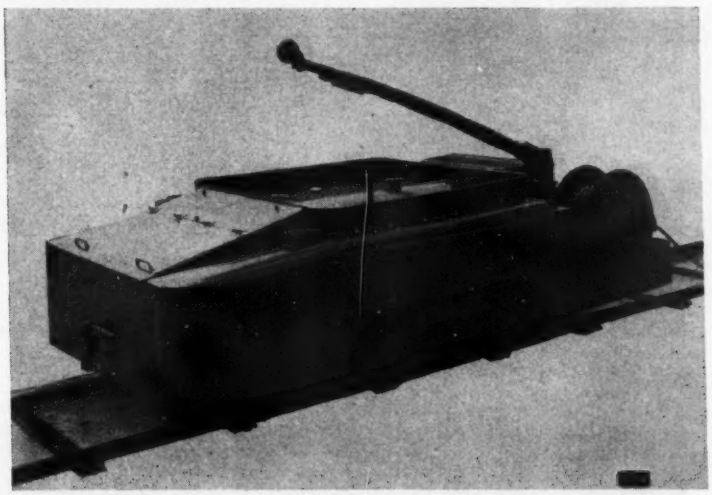
7. General improvement of transportation of coal from the mechanical loading device (this may be by (a) the increase in size and capacity of conveyors, mine cars, and shuttle cars, (b) the speeding up of gathering locomotives or conveyors, and (c) less delay in unloading shuttle cars in the switching of cars at loading stations, etc.).

8. General improvement in (a) the transportation of men (particularly by the use of specially designed man cars) and (b) of supplies.

9. General improvement in the design of mining machinery in order to facilitate the inspection, maintenance, and repair work on these machines.

10. Recognition of the hazards of mechanical mining and concerted effort to apply remedies. This is evidenced by programs organized in cooperation with the United States Bureau of Mines, State Departments of Mines, Operators' Associations, technical societies, and the United Mine Workers of America. Recent illustrations of this are the 1945 programs and sessions of the Coal Mining Institute of America on the subject "Prevention of Mine Fires from Electrical Origin." There has been increasing attention to supervision of working faces with improved ventilation and rock-dusting.

11. Cooperation of labor. The increase in wage rates has proved a challenge to management to use labor effectively, to eliminate delays and unnecessary loss of time in moving men and equipment, to maintain production machinery in good operating condition, to have proper tools and supplies readily available, and working places in proper shape for production during the working hours. To secure the highest grade labor, the work must be safe and drudgery must be eliminated; the men must be trained for the work and supervised by intelligent efficient leaders.



Lee-Norse mobile greasing truck

Goodman bug-duster for shortwall cutter

Low-Height Equipment

The problems of low-height coal continues to receive most serious study. The hardships resulting from working in cramped positions, the hazards and the difficulty of moving about in low coal, and the time lost by traveling about have been pointed out most forcefully. E. H. Jenks has said:

"The prime purpose of a mechanization program is to make more productive use of human energy and as the greatest waste of energy in a low seam is traveling through low places, any system which prevents this traveling will prove to be the most satisfactory, both as to the tons per man employed and cooperation from the man." *

Much thought is being given to adapting equipment to low coal. The following developments may be noted:

1. Track loading-machines that stand 28 in. over the rail are now in service.

2. Caterpillar-mounted loaders that are 26 in. high above the mine floor are available.

3. The combined cutting-and-loading machine which has been available for several years has an overall height of 26¾ in.

4. Rubber-tired shuttle cars, 31 in. high, are being used successfully.

5. Large capacity track loading machines have a minimum traveling-height of 31 in.

6. Large capacity universal track cutting machines have a traveling height of 33⅜ in.

* *United Mine Workers Journal*, December 15, 1945, p. 19.

7. Fifteen-ton trolley locomotives, 26 in. high, are used for main-line haulage in low-height mines where it is not economical to brush the haulage road.

Trackless Mining

While trackless mining is not new, it is worthy of note that there has been substantial extension of conveyor mining in sections of old mines and some of the new mines are fully conveyorized.

Among the improvements in the later developments in trackless mines are (a) wider and faster belts, (b) improved facilities for loading along the line of the belt, (c) provision for reversing the belt, and (d) two-speed motors.

Large Capacity Equipment

During the year improvements have been made in standard types of track equipment, as well as rubber-tired and caterpillar-mounted equipment for both cutting and loading. New models are in the process of design and construction.

The application of shuttle cars in pillar mining has called for increasing flexibility in loading machines, shuttle cars, cutting machines, and auxiliary equipment. Improved mountings of universal cutting machines are available, or are promised, at an early date.

Track loading machines have been improved and have been making new records of loading in wide work and pillars. With the installation of large-size mine cars, there is increasing effort to improve the track and the track-laying operation. Gathering service is improving in both development and production areas. Considerable progress has been made in applying storage battery locomotives in gathering service.

Full-seam mining is attracting more attention because of the continued improvement in the operating record of the mines that have used this system for several years. The use of this system, where the roof material is apt to fall before the cut has been loaded out, has made it possible to secure large tonnages from the equipment by avoiding delays and, at the same time, discontinuing the hazardous practice of sending men to the face to clean up falls of roof occurring during the loading operation.

When the mine floor is not hard and is wet, problems arise that make mining with certain types of equipment difficult, if not impractical. The logical method of dealing with these conditions is to use track cutting and track loading equipment, unless the grades are too severe. Usually these problems of unfavorable grades can be overcome by intelligent planning. Some noteworthy installations of track equipment are being made to meet these difficult conditions.

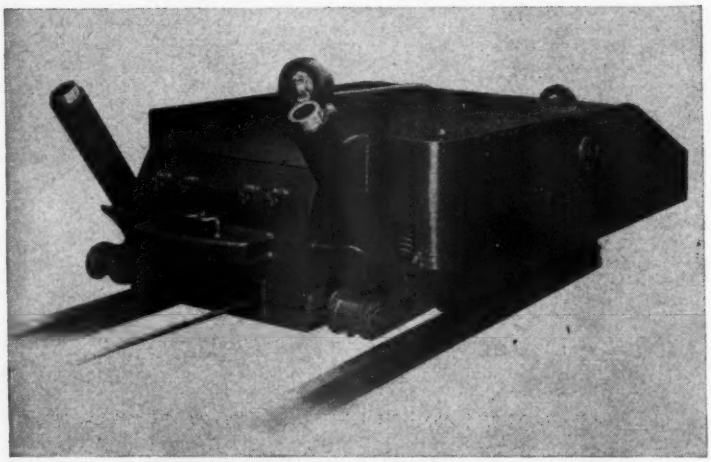
Duckbills

Power Duckbills

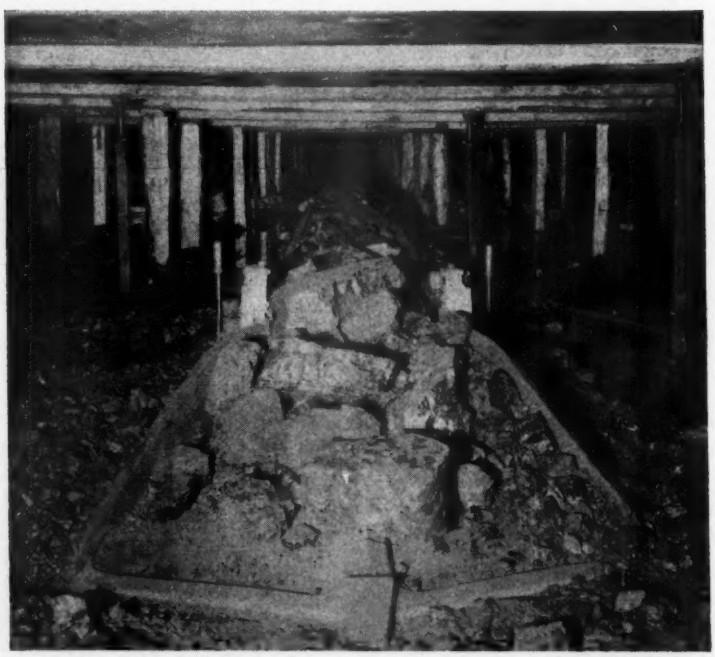
The development in the power duckbill has been a notable achievement and this equipment shows promise of giving very good production records, particularly in wide rooms where pillars are not to be mined. The possibility of using the power duckbill effectively in pitching seams is worth intelligent investigation, as well as the slabbing of pillars where roof conditions permit.

With the power duckbill it is no longer necessary to bar the duckbill across the working face because by a simple wire-rope system the operator of the duckbill can swing it quickly right or left by pushing a button. An improved feeder mechanism provides a faster movement of the shovel trough on each stroke. The wire ropes which swing the shovel from side to side may be used to pull the entire power duckbill forward after a cut has been cleaned up, or may move the unit from place to place.

While the cutting and loading operations are performed separately, with the power duckbill it is practical to have the cutting and loading proceeding simultaneously and safely in a wide room, thus increasing the ca-



Brown-Fayro track mounted post-puller



The power duckbill loader of Goodman

pacity of the working place and of the face and conveyor equipment.

Shaking Conveyor Drives Mounted on Trucks

At a very progressive Canadian coal mine where shaking conveyors with duckbills are used in entry driving, the conveyor drive is mounted on wheels on track so that the equipment may be advanced quickly and efficiently at frequent intervals. This permits more continuous production from the unit and eliminates the delay normally incident to moving the drive forward after an advance of about 300 ft.

Bug Dusters

The mechanical handling of cuttings by improved bug dusters is worthy of note. While the removing of cuttings from the kerf is important in all methods of mining, when the crew is small, as is usually the case when the cutting machine serves only one or two places, it is important that the cuttings be removed mechanically in order to save the time required to do this work manually. Moreover, the mechanical device does a better job than can be done by hand, throws less dust into the air, produces coarser cuttings because the cuttings are not pulled back into the kerf, and reduces the power consumption of the machine per square foot of undercut.

Combined Cutting-and-Loading

The publicity given to the use of combined cutting-and-loading equipment in Britain and in Germany raises the question as to what is being done in the United States to develop machinery and methods that will permit continuous production. The British equipment may be used without drilling and shooting and the German system is used without drilling and shooting, both types of equipment being adapted only to longwall mining.

At the present time combined cutting and loading is being done successfully in the United States with shortwaloders, although this equipment is not now being manufactured for general distribution.* In coal 38 to 44 in. thick, rooms 40 ft. wide, six cuts are averaged during an eight-hour shift by these machines, the cuts being 5 ft. deep. With this type of equipment, drilling and shooting are required.†

Experimental work is in progress to develop a machine that will cut and break down the coal without shooting, and load the broken coal continuously in entries and rooms. Data are not available at this time on the progress to date.

* *Mining Congress Journal*, September, 1945, p. 26.
† *Mechanization*, September, 1945, p. 56.

Annual Review and Forecast

Equipment for Gassy Mines

In several mines in Canada, where electric cutting machines, drills, and loading machines are not permitted, progress is being made with air-driven equipment. In one longwall mine, scrapers are being used to haul the coal to a belt conveyor. In the recovery of pillars of thick coal, it is proposed to drive narrow entries with air-driven loaders, of the type used in ore mines, and scrape the coal from the pillars to the entries driven by these compressed-air loaders.

Improvements in Auxiliary Equipment

While there have not been many marked changes in the cutting and loading machines, there have been a number of developments of auxiliary equipment that have contributed substantially to improvements in production and reduction in operating cost.

Cutting and Drilling Bits

Undercutter bits with special steel inserts are now made in forms to fit most of the standard cutter chains. The cutting edges are Kennametal, an exceptionally strong cemented carbide, highly resistant to abrasion, the tips being brazed to bodies made of drop-forged and heat-treated alloy steel. These bits can be resharpened many times. With this type of bit, fewer replacements are necessary, less power is required for cutting, and coarser cuttings result.

Two-way drill bits of Kennametal are also available with drop-forged steel heat-treated bodies. Cutting edges are contoured for fast, uninterrupted drilling throughout the bit-life which includes many regrinds.

Timber Setting

The placing of heavy cross-bars in many mechanized mines has required a considerable crew of men to move the timbers to the face and to set them on scheduled time, whether the mine is equipped for track loaders or cat-mounted loaders. In some instances, the scheduled placing of timber in high coal seams has required more man-shifts than the loading operation.

As a result, considerable thought has been given to suitable equipment for transporting the timber to the working faces, lifting it to the required position, and holding it while the posts are being cut to fit and then set. Two types of equipment have been developed, one for shuttle car mines, and one for track mines. Both combine the same services and features, namely:

(a) hauling the necessary bars and posts from the timber side-track to the face,

(b) a power saw for cutting timber to the proper length, and

(c) elevating the cross-bars to the proper position and holding them in place while the posts are being set.

At a large track-loader mine, one timber setter is being installed for each operating section of the mine. A cable-reel is provided, as well as a trolley, in the track mines.

Post Puller

While the development of post pullers has been in progress for several years, the application of this type of equipment has been extended most satisfactorily to a variety of services during 1945. There are three services required of some of the units built for this work:

(a) pulling and recovery of timber in gassy portions of trackless sections of mines,

(b) recovery of timber and track materials in gassy portions of sections of mines in which track is laid, and

(c) recovery of timber and the withdrawal of conveyor equipment, track, etc., in low-height coal mines.

Two types of equipment are available:

1. Rubber, or cat-mounted, permissible units for trackless areas.

2. Track-mounted permissible units which can be anchored and which are equipped to develop two rope-speeds, haul sleds loaded with timber and other material. When sleds are used a back-haul drum is a necessary accessory.

Self-Propelling Conveyor Drives

Although the practice was developed at least five years ago, the mounting of conveyor drives so that they may be self-propelled has been extended considerably through the year. At Turner No. 3 mine of the Sizemore Mining Company, a 10-hp. chain conveyor is mounted on wheels with pneumatic tires. The mounting is so designed that one man can operate and steer it and it will move at 70 f.p.m.*

Greasing Truck

Transporting lubricants to mining machinery at the working face and making proper lubrication convenient may be facilitated by the use of equipment designed for this purpose. This

* *Coal Age*, January, 1945, p. 92.

is important in all mechanized mines but particularly in those that are multiple-shifted.

In the accompanying illustration is shown a self-propelled unit mounted on track wheels, taking power from the mine trolley system and operated the same as a trolley-cable reel locomotive. The motor which propels the unit also drives an air-compressor to furnish necessary air to operate the alemite-air-grease and lubricating pumps and guns. The truck is a complete mine service station on wheels. It carries approximately six barrels of mine lubricants and provides a quick and efficient method for lubricating mining machinery at the working face.

Rubber-Tired, Self-Propelled Drill Unit

As a companion piece for use with the rubber-tired universal cutting machine, a rubber-tired unit with one or two drilling units has been developed. Usually two men are working together in operating and moving a drilling unit, and, therefore, two separate drills are mounted so that the drilling task may be completed as rapidly as possible.

Rock Dusting in Trackless Mines

The increasing rate of advance of entries and rooms, and the retreat of breaklines when pillars are mined, impose increasing responsibility on management to apply rock dust promptly as required by safety regulations. The application of rock dust systematically and mechanically is now an accepted part of the routine of all mechanized mines.

Light-weight permissible distributors that can be carried on shuttle cars with the rock dust are now available. For conveyor sections these small rock-dust distributors can be handled on a rubber-tired truck and dust a room using a 50-ft. hose. Similarly, these light-weighted units may be used effectively in the advance sections or back entries of track mines. Some of the smaller units can be transported on belt conveyors.

Streamlining Main Haulage

The challenge of the principle of trackless mine transportation has met with a response that continues to improve mine tracks, mine cars, mine locomotives, and the systems of scheduling underground transportation. It may be predicted that 1946 will see substantial improvement in track and mine cars as steel becomes more plentiful. Heavier track and eight-wheel cars are scheduled for several large operations.

With these developments, and the increase in length of haulage roads, still further improvement in trolley locomotives may be expected. Among the announcements of recent locomotives are the following:

Tandem locomotives with a total of 720 hp. in two 25-ton locomotives, distributing the weight over 12 wheels. Each locomotive has three motors with a blower on all motors.

Thirty-ton single-unit locomotive consisting of two double trucks with two motors per truck, the trucks being swiveled to a center beam. This unit will have 500 hp. in motor, with a speed of 12 m.p.h. at full drawbar pull and 20 m.p.h. when running light.

Self ventilated 15-ton locomotives, 26 in. high, with two 90-hp. motors are now available.

Expediting Transportation of Coal

It is noteworthy that operators and manufacturers continue to give much thought to the problem of taking the loaded coal away from the working face and the loading unit. Several different schemes and devices may be cited:

1. Increased capacity of conveyors and of shuttle cars (maximum, 10 tons capacity) requires rapid handling of coal at the transfer point. This means

(a) direct loading into mine cars of large capacity which must be shifted quickly,

(b) loading small mine cars through a boom-loader,

Joy loading machine in low coal

(c) discharge onto an elevator having storage capacity, or

(d) in case the coal in large capacity shuttle cars is to be taken away by a belt, a "belt feeder" may be installed so that the load of the shuttle car may be discharged quickly and then fed slowly onto the belt.

2. Discharging shuttle cars onto a shaking conveyor with built-up sides in a pitching seam.*

* *Coal Age*, June, 1945, p. 93.

Summary

In anticipation of a new era in mine mechanization, we may expect:

1. Additional types of shuttle cars and increased use of large capacity mine cars.

2. Improved mountings of cutting machines for trackless mines and a complete line of auxiliary equipment on rubber tires.

3. General improvement of cutting machines with better bits and general use of bug-dusting devices on short-wall machines.

4. Conveyor drives equipped so that they may be moved with little delay.

5. Coal loading machines, shuttle cars, and conveyors designed and built rugged enough to handle mine rock (this being desirable if run-of-seam mining is to become general).

6. Small loading machines designed for operating on pillar lines. Within a short time there will be available a light-weight, low-height, loading machine especially adapted to loading in pillar sections. This machine will have an overall height of 26 in. and coal-travel line of 19 in. The rear conveyor may be swung through an angle of 180 degrees. It is stated this machine will load rapidly into conveyors, low-height mine cars, or shuttle cars.

It is the hope of many operators, mining engineers, and manufacturers that the men returning from the armed forces may make many improvements in machinery and operating practice.

The following inspiring paragraph by Edwin H. Johnson, chief engineer of mines, Republic Steel Corporation, written in May, 1945, deserves reprinting as it states exactly the ideas the writer has found in the minds of many coal operators and manufacturers:

"The most interesting period in the history of coal mining should be the one that follows the war end, because the flood of new ideas and machines that will be released will find a more sympathetic reception by mine operators than ever before." *

* *Mining Congress Journal*, May, 1945, p. 64.

Open Pit Mining in Bituminous Coal

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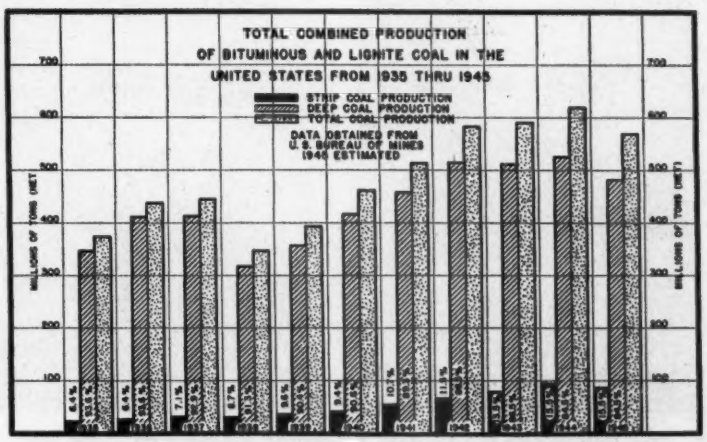
Equipment To Handle Heavier Overburden and Improvements in Preparation Methods Will Enable Strip Mining To Increase Its Production For Future Coal Markets

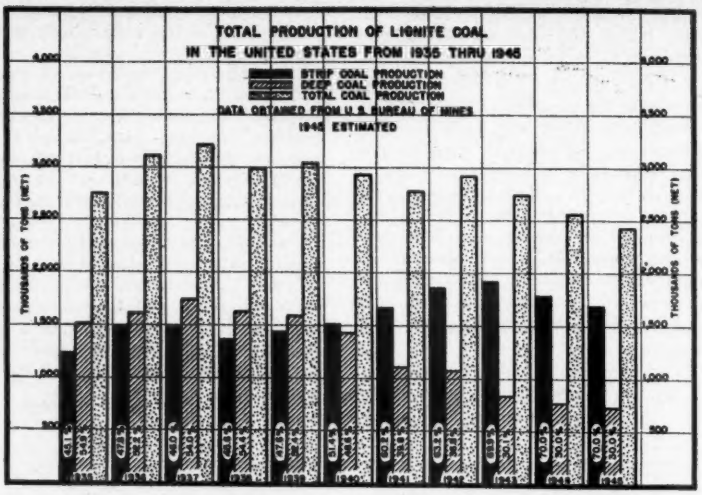
INDICATIONS are that postwar production trends of lignite and bituminous open pit mining will continue to be at least as favorable as they have been in the past few years and although the end of World War II marked a resultant decrease in the demands for coal of all types, the general trend of open pit mining has continued upward. The total output of coal produced in 1945 was lower than 1944; while part of this was due to lack of auxiliary demand, the scarcity of material and supplies, as well as shortage of manpower were primary causes. As returning military personnel joins the ranks of those working in the coal mines, and as industry generally reconverts to civilian production, this situation will be remedied and the open pit coal industry will be in the vanguard of the progress parade.

Growth of Stripped Coal Production

In the acompanying chart showing total lignite production of the United States for the past 11 years, it is interesting to note that the percentage of open pit lignite production has increased from 45.1 per cent of the total in 1935, to 70 per cent for the estimated figures of 1945. Similarly, in the chart showing the combined total production of bituminous and lignite coal for the U. S. A. for the past 10 years, open pit mining shows a steady increase from 6.4 per cent of the total, to 15.5 per cent for the estimated figures of 1945. These trends are an important criteria as they reflect depression as well as war years and certainly mean that open pit operation has become a fundamental part of America's extractive industry.

In the infancy of open pit mining, depths of overburden removal were limited by the size of stripping equipment; as a result, the reserves of strippable coal were considered small, and it was anticipated that these would soon be exhausted but as the size of the shovels increased, it was




TOTAL PRODUCTION OF LIGNITE COAL
IN THE UNITED STATES FROM 1935 THRU 1945
STRIP COAL PRODUCTION
DEEP COAL PRODUCTION
TOTAL COAL PRODUCTION
DATA OBTAINED FROM U. S. BUREAU OF MINES
1945 ESTIMATED
THOUSANDS OF TONS (NET)

found that the reserves were correspondingly increased by the areas within deeper overburden limits. The increase of shovel size and range continued until about 1940, when the trend turned toward the development of greater draglines, the largest of which now have 25 cu. yd. buckets and 180-ft. booms, with walking mechanism for maneuvering over soft material. Plans are now being promulgated for machines with 45 cu. yd. buckets and 200-ft. booms; these should lower operating costs, and permit economic recovery of coal to still greater depths. All of these advancements serve to increase the reserves of open pit coal and insure a longer life for the industry. However each change in excavating machinery also had to improve operating efficiency in order to overcome the greater ratios of overburden to coal; otherwise the economics of competition would eliminate the practicability of deeper stripping.

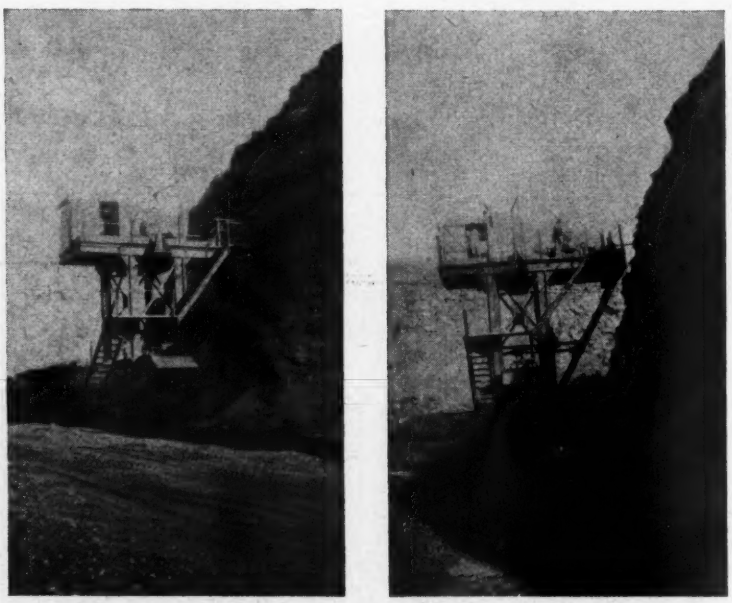
Machines for Deep Overburden

With the advancement in new type machines, we cannot ignore the faithful service performed by the many smaller draglines and shovels which are still operating, even though some are more than 20 years old. They have been a very potent factor in maintaining peak wartime production. However, it is anticipated that with the return of business to normalcy, a great many of these small units will be returned to their primary field of endeavor—the contracting business—while the other obsolete machines will be replaced with units of modern and improved design, such as is shown in the accompanying illustration. This is particularly true in the Eastern fields where open pit mining output increased about 40 per cent during wartime years and was instrumental in maintaining the production lost by deep mines due to manpower shortages.

Besides the well-known use of shovels, draglines, tractors and scoops, several other methods of stripping have been in use during the past year. In a lignite operation in North Dakota, the bulk of overburden at one mine is removed by means of tower excavators, using 12 cu. yd. crescent scrapers. This operation is unusual, in that the upper overburden above four cuts of coal is uncovered at one time. The final clean-up is made with the conventional shovel. Since the average depth of cover at this operation is about 65 ft., we have another example of the adaptation of machinery for removing deep overburden beyond the limits of the ordinary shovel.

Another method of recovering coal below deep stratas is the use of the wheel excavator, which has been operating during the past year in central Illinois. This tool, working in tandem with a standard stripping shovel, has been used to remove the upper reaches of the virgin bank, mainly the soil, clays and lighter shales.

The use of draglines on the spoil banks as booster units to move the material back, in order to give the large stripping shovel more casting room, has been used quite extensively for deep stripping. Although this means rehandling of the overburden, which is considered costlier, the yardage performance of the large strippers have shown an improvement of from 10 per cent to 15 per cent, because it is not necessary to stow the material so carefully and at the extreme reaches of the machines. The latter is quite important in saving the extra expense of maintenance, repairs, rope life and power.



Two views of deck-type horizontal drill showing elevated auger in operation

Drilling and Blasting Overburden

Stripping tools are only efficient when the bank they are digging is properly prepared. Continuing experimentation and improvement is being made in the drilling technique and the machinery used. Naturally, different structure and hardnesses of rock require various kinds of drilling, as is shown by the use of horizontal and vertical augers in some localities, and the application of churn or rotary vertical drills in other areas. One of the larger machinery companies has made

a great many tests during the past year with vertical rotary drills, using the wheel or gear type bit in thick massive rock formation. Early reports indicate lower operating costs and greater speed than with the more conventional type now in use.

In the past year or so, tests have been made with deck type horizontal drills, where a horizontal augur is placed on a portable crawler mounted tower, about 25 to 35 ft. above the coal berm, and drills a row of holes in the upper layers of the overburden. This, combined with the regular row of holes drilled horizontally from above the coal berm in the usual manner, gives a great enough area for equal distribution of the explosive, thus causing good fragmentation throughout the entire deep bank. This method eliminates the necessity of drilling diagonal holes upward from the coal vein as was the previous practice, with not too satisfactory results particularly in deep overburden. Of course, drilling by the above method is only practical where the hard rock formations are interspersed with shale or softer rock strata which can be penetrated with the augur type bits.

Drill tool manufacturers are continually experimenting with new alloys and various types of bit coating, and as a result, drilling footage has steadily improved. No doubt, this trend will continue in the future.

Fixed explosives and liquid oxygen are being tested in various ways to more thoroughly fracture the overburden and lower the explosive costs per cu. yd. Many questions have been asked concerning the possibilities of using atomic energy for this purpose as well as replacing coal as a source of heat. However, at present the consensus indicates that it will be quite a number of years before costs of this type of energy will compete economically; also other restricting factors are the danger from radioactivity, explosive hazards, possible short supply of uranium, cost of shielding against radiation and the probable governmental restrictions on atomic energy materials.

Haulage equipment has not changed greatly during the war period, as manufacturers were so busy with ordnance work that engineering time and manpower was not available for many new developments in the industrial field. Their activities were directed primarily to making standard models, and repair parts to keep this equipment in operation, which, in turn, caused operators to pay particular attention to careful and proper maintenance of the haulage roads with respect to drainage, subgrades, ballast and surface. This has been doubly important because of the critical tire situation during the war period and constant tire repair and recapping has proved economical to those operators who depend for their production on truck haulage equipment. Although manufacturers expect better results in the future from the new synthetic tires in the truck types, experience so far has not been too satisfactory.

Coal Preparation Improved

New developments in preparation facilities have been limited during the war years, but a great many new ideas are being discussed for new plants and revisions to those already in existence. Particular consideration has been given to more careful and greater recoveries in the cleaning and washing of the fine coal (slurry 20 mesh minus) which previously was pumped out to refuse. These greater recoveries have been established by using several well known types of equipment with a centrifuge in the circuit and blending the fine coal thus recovered with other grades of coal has improved the quality of the product.

Considerable experimentation and development is now being made in the use of heavy media for more careful washing of coal. The advantages of

Coal stripping with 25 cu. yd. dragline and 180 ft. boom

this is that it is considered possible to maintain specific gravity of the wash water within closer limits to conform to variations in the character of the coal.

Drying the coal, whether by the heat type or centrifugal, is still a problem that has not been solved completely to everyone's satisfaction, but new ideas are being continually advanced to eliminate the heavy maintenance required on screens in such units. Some thought has been given to the possible use of infra-red rays as a method of drying, but this has not reached a practical stage as yet. Manufacturers, as well as operators, have experimented with various types of dewatering screens in an attempt to find a wire with better wearing qualities. Present abnormal wear in screens causes loss of oversize coal to the slurry ponds, or oversize in the fine coal circuits, and eventually a discrepancy in the true sizes of the small types of coal loaded for the market.

It is anticipated that with the advent of additional mechanical stokers in the industrial and domestic fields, more coal will have to be crushed at the mine preparation plants in order to fulfill this changing market demand. Consequently, new plants will be designed with more facilities for crushers and breakers while old plants will install such units in order to produce the sizes required.

Now that priorities have been lifted on the use of oil for dust proofing, most plants producing domestic stoker coals will find it necessary to install equipment for treating the smaller sizes with a high viscosity oil or such other materials as may be developed for this purpose.

Several plants in this country have been successfully pumping refuse in the sizes of 4 x 0 in. rather than hauling it by truck. Open pit mines are particularly adaptable for this method because the old cuts which are left full of water provide adequate dumping areas as well as furnishing a large water supply. This latter is especially important, as only 20 to 25 per cent solids can be pumped. With the improvement in the design of impellers, volutes and shells for refuse pumps, more of these types of installations will probably be made in order to lower operating costs. Pumping of refuse has an added advantage in eliminating the hazard of spontaneous combustion so prevalent in most gob piles; this is because the refuse and slurry are pumped together, and the latter tends to seal or fill the voids between the larger pieces thus preventing the entrance of air and the subsequent oxidation.

Chemical laboratory control is very important at all of the larger mining companies, and some of the open pit mining associations in the various states have built their own laboratories to furnish analytical facilities for the smaller operators who are not so equipped.

Reforesting Indiana spoil banks 12 years after planting

Safety and Maintenance

Safety at the open pit mines is being strongly stressed, not only by the operators, but by representatives of the insurance companies. Posting of signs, regular safety meetings and periodical surveys by safety engineers are an essential part of the program.

Improvement in electrical efficiency is consistently being emphasized, particularly in the use of Rototrol and Amplidyne on the swing and hoist motions of the large draglines and stripping shovels. These controls improve the operations of these motions and eliminate the variations due to the human element in overloading the electrical equipment.

Fortunately, most open pit mining companies have practiced careful maintenance throughout the war period, and this is paying particular dividends because it seems that materials and supplies are even more difficult to secure now than they were when the priority system was in effect. With the inevitable let-down after the war, and the innumerable strikes throughout the country, certain items have been exceedingly hard to procure. Because of this, a heavy burden has been placed on the maintenance men in order to keep the mines operating efficiently to produce the critically needed coal during the past and coming winter. Ingenuity, which was so helpful during the war period, has been sorely tested the latter part of 1945, and superintendents, foremen and miners deserve credit for their efforts in the emergencies.

Prospecting for Future Operations

In an industry of diminishing resources, such as coal mining, prospecting must continue. Practically all open pit companies have had drilling crews in the field at all times, and although desirable strip areas are becoming more difficult to find, many new territories have been proved as future reserves. Probably the greatest activity during the past year has been in Western Kentucky where reports indicate substantial areas of coal have been assured. In addition, the development of larger machinery for stripping to greater depths has opened up new areas for prospecting in the vicinities of present operating mines.

Very few changes have taken place in the technique of prospecting although the trend has been toward mounting augers, churn and core drills on tandem wheel trucks for quick mobility in the field. Mechanical prospecting has been almost a necessity during the war because of the shortage of manpower; however, hand tool crews are still indispensable for testing areas that are inaccessible to motive units. Not only has the importance of the test holes themselves been emphasized, but the securing of core and channel samples for washability tests and chemical analysis have been carefully checked.

Double-Seam Mining

Prospecting, has in some cases, shown the feasibility of double seam mining. Already several companies are recovering two veins of coal with an interval of overburden between, ranging from a few feet up to 30 ft. Several fields are known in which two or more seams are available, with suitable economic ratios of overburden, and they will lead to some interesting ideas in development and methods of operation. Double seam mining usually requires either two draglines, two stripping shovels, or a combination of both. Occasionally, if the interval between the two seams is not too great, the coal loading shovel can be used on off-shifts for this purpose. The nature and hardness of the overburden between or over the seams is usually the governing factor in the type of equipment used in such operations.

Land Reclamation and Reforestation

Spoil pile utilization by strip operators has received considerable attention for the past 15 years and is being handled in a scientific and logical manner in practically all states. Certain attacks have been motivated against the open pit miners by uninformed parties and some political factions backed by certain unscrupulous interests. The accusations set forth have led the public to believe that open pit mining is causing soil erosion, increasing the hazard of floods, polluting streams, making inroads on agricultural acreages, and many other false ideas.

These attacks, which have little or no foundation, may lead to unjust legislation against not only the open pit miners, but against underground coal operations as well because of surface subsidence, and many of the other opencast mining industries such as lead, steel, zinc, aluminum, sand and gravel pits and rock quarries.

It is pertinent to point out what has been done and what is being planned in respect to spoil bank revegetation. Stripped land has been shown to retard rapid rainfall run-off and impound water in many of the old cuts, thus tending to hold or improve the lowering water table that has so worried conservationists during recent years. Similarly, this reduces the hazard of floods. Tests made on water in ponds formed by open pit mining shows that this water is not polluted or injurious and this fact is borne out by its use in watering live stock and for purposes of recreation.

Based on statistics available in some states, it is estimated that when all of the stripping coal has been mined, agricultural areas so disturbed will not be greater than one half of 1 per cent in any one of the states supporting this type of mining. And, of course, this mined over land is being continually rehabilitated by the planting of conifers, hard woods, soft woods, and many types of fruit trees. The sowing of grasses and legumes has made great progress in recent years, and extensive plans are projected for greater use of this type of revegetation. The banks have been seeded very successfully and economically by the use of airplanes. Strange as it may seem, lands so seeded have made fine stock ranges and from such trials records indicate a production of 70 lb. of beef per acre per grazing season.

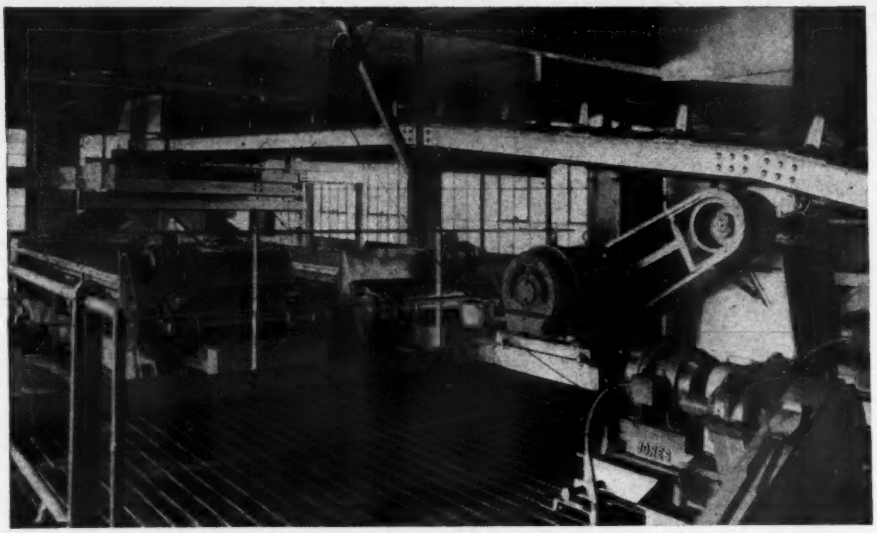
With the depleting reserves of forests for lumber, the thousands of mined over acres now planted in trees will some day be a valuable asset to our country. Conservationists and conservation clubs are enthusiastic over the fine game refuges and lakes provided by the mined over lands. In one case a state legislature authorized the purchase of about 1,400 acres of mined over land and is now developing it into a state park.

Strip Mining's Contribution to Victory

The bituminous and lignite open pit coal operators can feel justly proud of their efforts in bringing about victory in World War II, as a great share of the burden of accelerated coal production was borne by the open pit industry. When Government agencies found that it would be impossible to increase the productive capacities of other types of mining operations within the short time available to them —to the glory of the open pit operators, it can be said that they entered wholeheartedly into the job of winning the war. Forgetting selfish interest, they devoted all their time and energy to producing the greatest possible tonnage during the war years.

As a result of their experiences during this time of emergencies, the industry can look to the postwar period with optimistic anticipation. Statistical indications are that coal requirements may not be at the high levels of the war period, but as we enter a period of business prosperity, which is predicted for the near future, a steady market for the coal industry should be assured. Naturally, the open pit coal operators will benefit in their just proportion in such prosperity. Coupled with the anticipated business prosperity, the coal industry itself is making efforts to assure its continued progressive future by studious and conscientious efforts in research, long range planning, industrial experimentation and development of more efficient operating methods.

Truck haulage—an important phase of open pit mining



Primary separation — the first step in coal cleaning

Coal Preparation

Reports From Several States Indicate That The Coal Industry Is Anticipating Increased Market For High Quality Fuel and Special Products

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Improved Screening and Recovery of Fine Coal

By F. EARLE SNARR

Superintendent
Chicago, Wilmington & Franklin Coal Co.

WITH heavy emphasis centered on maximum production throughout the year 1945, there was very little development in the way of preparation plant construction in this district. Maintenance and construction crews at most plants were fully occupied in systematic preventive maintenance programs to keep plants producing at top tonnage while operating at prewar efficiencies.

The year did not pass, however, without the development of some preparation improvements, part of which came in the course of replacing worn plant units and others by way of minor alterations or additions. To obtain the largest possible shipped tonnage, many plants were called on to handle volumes previously considered beyond the capacity range, and in a number of instances, the tonnage ratings of the preparation equipment were raised without sacrificing cleaning or sizing standards. As a matter of fact, improved efficiencies were obtained in a number of plants even at increased tonnages.

Probably the greatest overall benefits were gained from improved screening. Replacement of Parrish type screens, when they required rebuilding, with vibrator screens in some cases permitted handling of increased volume. Usually these fit in the same available space and resulted in more accurate sizing. Plants already using vibrator screens or high speed Parrish screens, found that screen decks of improved design, using stainless steel cloth or perforated plate, afforded enough longer life to justify increased purchase cost, while conserving overtaxed maintenance labor.

Such screen improvements served the double purpose of maintaining standard sizing at increased volume in the larger sizes, and what was more important, permitted use of openings closer to the actual particle size desired. This was most beneficial in recovering a considerable tonnage of near-mesh sizes that had previously been discarded from stoker coals, by reason of using larger mesh cloths to obtain equivalent sizing.

Washery plants utilizing either or both the wet and dry processes, finding it necessary to forego the regular maintenance shutdowns, were able to improve on the design of cleaning unit assemblies and gain increased service life; in some cases the reduction of friction wear in control assemblies permitted maintaining closer adjustments which resulted in better separation.

Recent developments in methods of handling and burning fine mesh coals, such as those products generally removed in the preparation of stoker coals, suggested the recovery of valuable tonnages of slurry from the circulating waters in wet process plants. Several plants in the district have accomplished recovery of saleable slurry by drawing an underflow from settling basins or cones, and pumping the concentration to high speed vibrating screens. The recovered slurry cake ranging in size from 28 to 100 mesh, is usually dried in centrifuges, but in some instances is blended with prepared screenings. A number of plants originally designed to pump away set-

tling cone underflow to disposal, in some cases amounting to 100,000 or more gallons per day, have now reduced their makeup water requirements by as much as 90 per cent, and in so doing have retrieved sizeable tonnages of saleable coal. If makeup water is purchased, the savings are two-fold.

While there was little construction of new preparation plants in our district during 1945, it is generally known that many new plants are proposed for construction in the near future with engineering plans completed and only awaiting availability of structural materials and preparation units. It is a foregone certainty that the coming year will see several ultra-modern cleaning and preparation plants built and placed in operation in this area. These new plants will no doubt incorporate numerous advances in equipment design, many of which have been proven on small scale in existing plants during the past three years.

New Developments in Coal Cleaning

By J. M. GONDAR
Director of Laboratory
Koppers Coal Division

DURING the past year or so, two new processes for cleaning coal have been subject to much experimentation. First, the heavy media process as developed by the American Cyanamid Company, and second, the electrostatic or Johnson process developed by the Ritter Products Company, of Rochester, N. Y.

Heavy Media Process

This process has been in use in the ore industry for some time, and it has only been within the past year or so, that it has been introduced to the coal industry. It is a strictly sink and float proposition in which the desired solution gravity is obtained by adding magnetite to water. The process gives a sharp separation between coal and refuse. We are all familiar with the Chance process in which the desired gravities are obtained by using sand in water aided by upwards currents of water; magnetite, however, is much heavier and for this reason higher gravities can be obtained by its use.

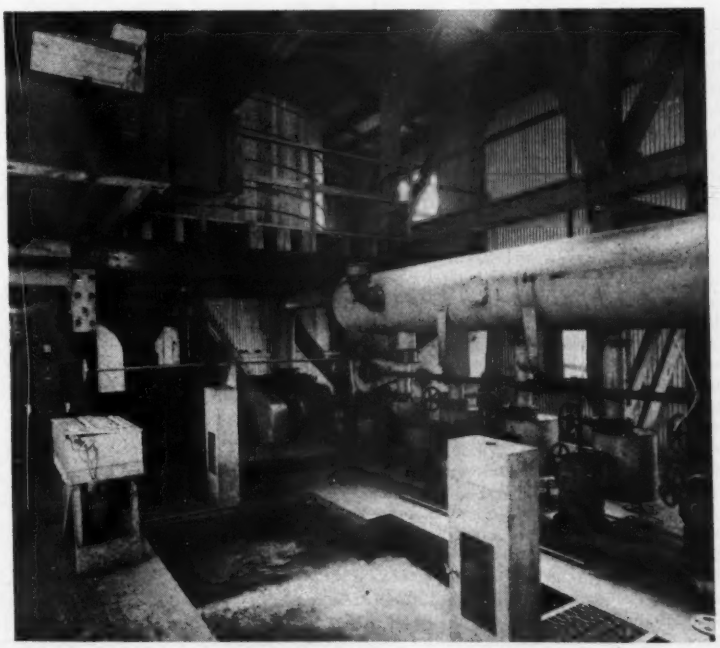
Briefly the process consists in passing coal into a cone containing the magnetite in suspension. The float coal passes out over a weir opposite the intake, while the refuse is removed from the bottom of the cone. After removal, the products pass over screens, the water sprays take out most of the magnetite; the magnetite is then dewatered and demagnetized and returned to the system. It is my understanding that a size range from 6 in. to 48 mesh can be washed without presizing. The magnetite used in the process amounts to approximately ½ lb. per ton of feed. Two pilot plants are under construction at the present time.

Electrostatic Process

This process, which is a continuous application of the old Huff method, has been in use in the mineral industry for some time. Considerable work was done on the electrostatic cleaning of coal in 1913, '14, and '15; however, the necessity at that time for mechanically screening the coal on 40, 60, and 80 mesh for the electrostatic separation made the process prohibitive, and no commercial application was attempted. Since then many improvements have been made which include the discovery of the "reversible separation of minerals," the development of electrostatic classification which has no vibrating parts and uses no screen cloth.

Unlike other cleaning processes which utilize specific gravity for the separation of coal from impurities, the cleaning in this case is accomplished by taking advantage of the difference in electrostatic susceptibilities. Gravity methods for cleaning +6 mesh coal can reduce the ash and sulphur content, but do not do a good job in the finer sizes and the electrostatic process has been designed to clean —6 mesh coal.

In brief the process consists in passing the coal over a series of rolls carrying a definite charge. To the front of these rolls and parallel to them are additional electrodes carrying the opposite charge. The clean coal is more affected by the charge and is pulled to the front, whereas the impurities are repelled or held back and by means of a moveable divider plate the products can be separated. Each unit consists of a number of electrodes, the number being determined by laboratory tests. The feed is from the top and the flow through the machine by gravity, and for best cleaner performance the coal must be dry—that is the surface moisture must be eliminated. This is accomplished by predrying the coal. Dust is continually removed by an air system, collected in cyclones, and is then combined with the cleaned products. One pilot plant is under construction.



Slate separation by wet washing

Double Screening Will Provide Outlet For Slack

By HOWARD ZELLER
Vice President
Jamison Coal & Coke Company

AFTER several years of a seller's market, when the consumer has accepted almost anything that would burn, whether it was black or not, the coal industry must prepare itself for return to competitive selling, without ceiling prices. In order to do this intelligently, a very careful examination should be made as to what can be the lowest possible production cost and the greatest maximum return. The effect of sizing and preparation on the return, should be carefully considered by a study of market conditions in the area into which the coal is sold, with special attention to study of any change in conditions which affect the demand for various sizes.

Many coal consuming plants are now obsolete and others badly depreciated by overload or lack of maintenance during the war period; consequently we believe that a great many new installations and revamping of old plants will be in order during the next few years. Anti-smoke ordnances in the cities and a desire for cleaner and more efficient heating in the home will result in many new stoker installations. These changes and the construction of new plants will probably result in a definite change in the demand for various sizes of coal in a given area.

It is our belief that more and more double-screened sizes will be demanded by such changes and it is well, then, to consider how we can increase the production of such sizes and how such increase will affect the price realization. Already there has been some consideration given to crushing lump sizes and in fact this is being done at some mines. Except for certain special purposes, slacks have, for many years, been our lowest priced material and crushing, to some extent, increases the amount of such fine material; it therefore appears to many that the procedure to effect the greatest maximum return is to screen a given coal to as small size as possible within efficient screening results.

All small slack can be used as powdered fuel and is now the main source of heat for most of the large power plants and cement mills. The consumption of this size will probably be considerably increased during the next few years as the large plants are modernized and expanded and the cement industry gets back into normal production. The screening of coal to the small minimum size will, of course, decrease the amount of small slack being produced and this should bring about a better market condition for such material than was formerly enjoyed.

There seems, also, at least in certain areas, to be a trend toward the greater use of double-screened sizes, both on hand-fired and stoker-fired railroad locomotives. While it is true that new burning equipment for locomotives is being developed, something should be done to increase the efficiency of the locomotives which are now in use and will be for some years to come. Less cinders resulting from the use of double-screened coals instead of mine-run and their affect on road-bed drainage may assist in bringing about such a change.

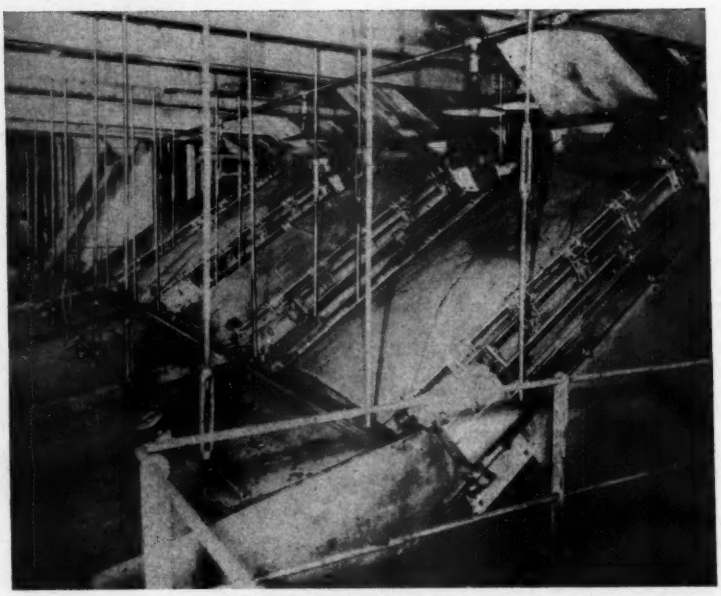
Greater Screening Capacity Needed

Where screening is undertaken to such small bottom sizes, care must always be taken to insure sufficient screen capacity to obtain proper and efficient results. Many mistakes have been made by the installation of insufficient capacity, which usually results in larger screen openings being substituted and hence making a larger minimum size than desired, with an accompanying increase in the amount of small slack produced. This is probably due to lack of proper information by both engineers and manufacturers as to the effect on the efficiency of a vibrating screen when moisture is present, as it very often is in the small slack coal. With additional moisture, the efficiency drops very rapidly and this is particularly true of most coals when extraneous moisture exceeds 3 per cent or 4 per cent.

In some districts this question of screen capacity has become increasingly important to consider, where the use of water at the face or transfer points is required by the mine inspection departments to reduce dust underground. It is, therefore, very important when installing screens for small size minimums, where wet washing of small slack is to be avoided, that ample allowance be made for the moisture effect on screen efficiency.

Preparation and sizing do, of course, to some extent, increase production costs, but in most areas the greater return accomplished by such preparation and screening will, no doubt, exceed considerably the production cost increase. This can only be determined by careful study of all factors and in addition, probably a little guessing as to possible changes in marketing conditions.

Certain mining districts have made great progress in the marketing of their coals by both preparation and extensive sizing and the future will undoubtedly see further improvements in equipment and results.



A battery of vibrating screens

Mines Must Meet Demand For Stoker Fuel

By C. V. BECK
Clarence V. Beck & Co., Inc.

MECHANICALLY prepared coal of all types increased its tonnage in 1945 although there was little change in the standard methods of washing or air cleaning. The demand for small domestic stoker sizes has strengthened materially and now that stokers are back on the market a growing demand for this product can be anticipated in the future. The public is showing a marked preference for domestic stoker coal of less than ¾ in. top size and a large number of preparation plants are making stoker fuel approximately ⅝ in. top by No. 6 to 10 mesh bottom.

To supply this market many operators are crushing large quantities of coal and it seems like the most successful crushers for this work are the large hammermill or ring type operating at very much reduced speed. The necessity for making large amounts of stoker fuel is leading to a number of problems, one of which is that considerable quantities of pure dust, approximately minus 6 to 10 mesh in size, must be disposed of. A good deal of work has been done to create a market for these sizes, mainly for powdered coal plants who are now being gradually educated to their use. The principal objection, however, is difficulty in handling. Some operators are turning to the idea of briquetting or coking this dust.

Another problem that presents itself is that if washed coal is crushed into this size, the screens will blind and there is great difficulty in properly screening wet coal and getting a clean product as small as No. 6 to 10 mesh. Also, where a No. 10 x ⅝ in. feeds perfectly in domestic stokers when it is dry, when it is too damp or moist it doesn't feed properly and is inclined to arch in the hopper. Therefore, of necessity it seems this size must be reasonably dry before it is crushed, sized or offered to the ultimate consumer. Then there is difficulty in getting the proper price for this product, because after crushing coal down to this small size, mechanically cleaning, drying, screening and oil treating the final product, and then creating a market for the large amount of pure dust produced, it becomes the most expensive size coal a mine can prepare, instead of being somewhat of a by-product as heretofore considered.

This type of coal promises to become the main domestic product in a short period of time and consequently it will have to bring the highest price of any prepared coal. The present price under OPA regulations is generally insufficient, particularly if this becomes the main domestic product of the mine, so the problem that now is facing the coal industry is how to properly prepare domestic stoker coal. The difficulties which will be encountered by many operators, can be solved but their solution will require a vast amount of preparation machinery and heavy capital expenditure.

Anthracite Enlarges Preparation Facilities

By W. J. PARTON
Preparation Engineer
Lehigh Navigation Coal Company, Inc.

NO radical changes in coal preparation practices took place in the anthracite region during 1945. Development and research work were followed as much as possible, but operating problems required most attention. Particular interest was directed toward the cleaning of fine sizes, and most of the new equipment installed was for cleaning the No. 4 and No. 5 Buckwheat coal. Development work was done also on new equipment for cleaning the ultra-fines.

Several new cleaning plants were built for reclaiming bank material. Equipment installed in the larger breakers include Chance Cones, Wilmot Hydrotators, Manzie Cones and Diester Concentrating Tables. Fine coal cleaning equipment was added to many existing plants to supplement the original facilities.

Considerable interest was shown and much pilot plant work was done on the use of the Heavy-Media Process for cleaning coal. The original cones and screw classifiers are now used for ore concentration and different types of equipment for coal are being developed. A new cylindrical shell which will be rotated in a manner similar to the rotary dryer is now being constructed for use on coal by one of the equipment manufacturers.

The new froth flotation plant of the Lehigh Navigation Coal Co., Inc., with a capacity of 40 tons per hour of cleaned coal, has been operating since April, 1945; this recovers the silt from 7,000 g.p.m. of water discharged from the Tamaqua Colliery cleaner. The oversize material is removed from the feed to the plant by a unique hydraulic classifier — vibrating screen circuit. The flotation feed is cleaned by two individual cleaning circuits, i.e., a primary circuit and a scavenger circuit and the dilute tailings from the primary cells is re-thickened before it is sent to the small scavenger cells. Dewatering of the froth is accomplished in a Bird centrifugal filter.

A new froth flotation plant is being constructed by the Susquehanna Collieries Co. at No. 7 colliery, Nanticoke, Pa. A new type of cleaner, the Humphreys spiral concentrator, is being investigated for cleaning the anthracite fines; several units have been purchased for test purposes.

The anti-pollution agitation culminated in the passing of the Brunner bill on May 8, 1945, which includes coal-silt as a polluting property but allows sufficient time to obtain equipment and constructing necessary facilities to prevent pollution. Settling and impounding facilities are being improved or installed by many of the anthracite operators; the Lehigh Navigation Coal Co., Inc., installed two

180 ft. dia. thickeners and constructed impounding dams to retain the waste solids. The use of agents to increase the settling rate of the solids and thus raise the capacity of thickeners is being practiced and lime is used by many plants to neutralize the acid water as well as to flocculate the solids. The 8,000 gal. breaker discharge at Lansford Colliery of the Lehigh Navigation Coal Co., Inc., is treated with 230 lb. of starch (in a causticized state) per day to increase the capacity of the present settling tank.

Two large briquetting plants are being constructed at the two central breakers of the Philadelphia and Reading Coal and Iron Co., and this company also installed a new electric larry train rock-disposal system at the Oak Hill Colliery, Minersville, Pa. The four-car larry train operates on grades up to 10 per cent and is powered by a 750 k.w. 600 volt sealed-tube ignition rectifier; the first three motorized cars have two-way side dump bodies while the trailer car has side and end dumping. Approximately 90 tons of refuse are hauled each trip.

A modern anthracite breaker

The Nickel Industry in 1945

Abstract of a paper by Robert C. Stanley, President, International Nickel Co.

DELIVERIES of Canadian nickel to all markets in 1945 were approximately 25 per cent under the peak levels attained during the war years, but were in excess of all but one peace-time year. In recent months deliveries declined substantially from the corresponding period of 1944.

Up to V-E Day practically all nickel went into war uses of the United Nations. Controls on the use of nickel and nickel alloys were removed by the Canadian and United States Governments in late August and since then consumers have again been free to purchase their full requirements.

The war's end brought the nickel industry many of the same unsettled conditions that now confront other large industries. While the industry does not itself have the problems of reconversion, it must await the reconversion of its customers. It has no extensive plant alterations to make in this transition period.

Following the sharp decline in nickel consumption which occurred at the war's close, the fourth quarter of the year has witnessed betterment in the demand. This improvement would have been greater had it not been for labor troubles particularly in the steel and automotive industries in the United States.

To provide for war contingencies, the output of nickel was maintained in excess of requirements for some months prior to the cessation of hostilities with Japan. Stocks on hand were rapidly accumulating. The drop in consumption which followed placed the production of nickel far above current demands and forced operating curtailments.

As has been the case in the past, the steel industry in the United States continued to be the greatest consumer of nickel in 1945. Approximately 60 per cent of the total refined nickel delivered went into this field.

Four series of war-time engineering steels, which were developed by metallurgists of industry and government in the United States to conserve supplies of alloying elements, were adopted as standard by the American steel industry during 1945. These steels, which are known in the trade as "triple-alloy steels," contain nickel.

Of the nickel consumed by the steel industry for wrought steels during the year, over 40 per cent went into stainless steels. The tonnage of stainless steels during the past three war years has averaged the highest on record. Peace-time outlook for stainless steels is most encouraging. Some of the fields in which the uses of nickel-chromium stainless steels are expected to expand are the chemical, transportation and food processing industries.

The end of the war saw an almost immediate resumption of nickel electroplating. All decorative applications of plating had been discontinued under war conservation measures. There was a substantial pent-up demand. Research and new developments in the past few years have furthered the adoption of specifications calling for thicker nickel coatings. Nickel is already flowing in sizable amounts into plating uses. The automotive industry in the United States is planning to use heavier nickel plating in its 1946 line of cars and trucks, which will result in a marked increase in the consumption of nickel in plating.

The effectiveness during the war of cupro-nickel in condenser tubes on large ships and in piping in naval construction indicates broader use in peace-time applications. Much of this product will probably go into construction of new commercial vessels, coastal power stations, oil refineries and other equipment.

Due to war restrictions the use of nickel silver for civilian purposes almost ceased. With the reawakening of this market, production of nickel silver for peace-time uses was resumed late in the third quarter. Since then a large demand has been noted and a continuation appears likely for its many applications, a few of which are silver-plated flatware, slide fasteners and hardware.

Many war uses of nickel were in industrial equipment converted to war services and these will now resume their place as peace-time applications. New uses for the metal have been developed during the war and manufacturers who never used nickel previously have discovered its beneficial qualities. Additional peace-time applications perfected during the war years promise to compensate for losses to competitive materials.

Barring any unforeseen obstacles over which the industry has no control, long range prospects are favorable. World War II has utilized more technically advanced equipment than ever before and nickel was employed in most of its construction. Since much of this equipment will be produced for peace-time applications, nickel's usage will be broadened.

New Equipment and Methods In Metal Mining

With War Production Pressure Off, Industry Views Further Mechanization and New Mining Practices as Solution to Many Problems

METAL mining registered further progress in production methods and equipment during the past year and the industry is all set for further advances that are made possible by the war's end. Manpower shortages during the past few years and increasing wage levels have served to focus attention on operating performance and personnel problems. Also, both maintenance and development suffered greatly as the result of the demand for all-out production and the necessity of "getting along with what you have."

Full crews were a rarity in most mining operations until late in the year when a number of plants began to report that hires were beginning to run above the quits. Many companies had labor recruiters scouring the country in an effort to maintain their working forces, but in most cases the results were negligible. Underground training of new employes continued at a number of operations as the industry endeavored to offset its dwindling supply of experienced miners.

To assure top efficiency of personnel and to promote improved labor relations, training programs for supervisors continued and good results are reported. Following the theory that "a stitch in time saves nine," considerable attention was devoted to educating foremen in the provisions of contract agreements to lessen labor strife and to encourage productive efficiency. Safety instructions and inspections have been emphasized more widely to conserve both life and property, and to reduce costs. All in all, continued education of supervisors and workers is considered to hold promise of great improvements in mining.

Mine operators continued to show a high degree of ingenuity in maintaining machinery and equipment, as made necessary during the war years by inability to obtain replacement parts. The experiences of the past will undoubtedly have a favorable influence on future practices and costs, through encouragement of a higher degree of periodic machine inspections and preventive maintenance.

Further Mechanization Indicated

Underground mining methods follow established practices pretty much although the number of variations increases as advantage is taken of improved equipment and new applications of present units. Further mechanization is the order of the day through use of larger electric hoists and scrapers; shovel loaders in development work; rubber-tired trucks, shuttle cars or shaking conveyors for transferring ore, and drill jumbos. A trend toward electrification is indicated in Eimco's announcement that their RockerShovel is available with electric drive, either alternating or direct current.

Wider application of underground diamond drilling for blast holes is reported. Many companies with large ore bodies have gone to diamond ring-drilling with holes blasted by contractors. The Horadiam method of mining has proven to have many advantages. Also, considerable work is underway in diamond drilling of drifts and raises, with burnt cut speeding up advance. These practices are not entirely new but their development is of interest to the industry.

The Horadiam method of primary ore breaking with horizontal radial diamond drill holes from raises was worked out at Copper Mountain, B. C. Recent reports cite the advantages of this method of mining as follows: (1) lower costs through reduced preliminary development work, increased tonnage per man shift, lower powder consumption, and better supervision of both labor and supplies; (2) increased safety to workmen in breaking ore; and (3) a more selective method of extraction. Many companies using the square set system of mining are becoming interested in the vertical slice and slot method of stoping, which is

referred to again below. The slot method uses a "slot" across the stope for disposal of ore as compared with the conventional chute and down manway of the regular square set method. Advantages of the slot method are noted as higher production, simplified cycle of operations, filling enters stope during mining operations, large storage capacity, and less difficulties from ground taking weight.

Developments in shaft sinking centered around the new clamshell mucking equipment of the E. J. Longyear Co., with attention also being given to progress in sinking by rotary drilling and by stripping churn-drill holes. The Longyear machine consists of a powerful clamshell digger operated by two electric motors mounted on a movable carriage which is in turn mounted on the last set of timbers in the shaft and is lowered with the progress of the work. One motor operates the digging of the clamshell in picking up and dumping muck and the other motor swings the load over to connect with the hoisting buckets. A third motor is provided for the purpose of moving the clamshell carriage back and forth in the shaft as necessity requires.

On the iron range, the trends of the past several years have been more firmly established, namely: the use of diesel locomotives and trucks, belt conveyors transporting ore from pits, trucks of large tonnage capacity, and long-hole drilling and blasting. An innovation in the Lake Superior region, and possibly for the entire metal mining industry, is the underground belt transportation system to be installed in the Sherwood mine at Lake River, Mich. Two 36-in. belt conveyors, 850 and 650 ft. long, rated at 250 tons per hour, will be used to transport ore from shaker conveyors to the shaft, on the deepest, or 1,200-ft. level of the mine.

The comments noted above on some of the more important advances in metal mining are based on the observations of a number of mining men, including: L. A. Walker, manager of mines, United States Smelting, Refining and Mining Company, and J. Murray Riddell, Department of Mining Engineering, Michigan College of Mining and Technology. Further observations of interest follow.

Coeur D'Alene District

By J. B. HAFFNER

General Manager
Bunker Hill and Sullivan
Mining & Concentrating Co.

DURING the war years, the basic wages have been increased very substantially; special payments for overtime, shift differential, etc., have been decreed; the actual working hours have been decreased by having travel time decreed as working time; altogether resulting in much higher hourly working costs and less active productive time at the working places. These high war time wages cannot possibly be maintained without increased efficiency and output of labor.

We have not only the problem of seeking and obtaining increased performance of the individual worker but we also have the problem to provide conditions under which such increased performance can reasonably be expected. Better equipment and better working conditions must be provided and it is with these objects in view that certain noteworthy changes during the past few years have been made in Coeur d'Alene Mining District.

Jumbos with pneumatic columns and special features for raising or lowering cross arms have been devised and built for service in regular and smaller sized drifts and crosscuts. The Jumbos are constructed so that the columns with cross bars and machines may be folded down to provide for quick set-up and quick removal. Heavy duty drifters with power feed are used, all permitting speedy completion of the round. Sturdy and fast mucking machines, "cherry pickers," and ready locomotive service permit quick changes of cars, all resulting in completion of the entire cycle without undue delay.

The Longyear method of shaft sinking is going to be used for the first time in the Coeur d'Alenes in the contemplated work of sinking 1,500-ft. in the Silver Summit shaft. Even without an experience record on the Longyear method, it is felt that this provides a major step forward in the speed and reduction of costs in shaft sinking.

The Bunker Hill Mine is successfully using the so-called "slot system" for extracting its ores; by mining the ore in transverse slices from hanging to foot (rather than horizontal slices) the cost of extraction is appreciably reduced and large savings are made in back filling since all fill is placed by gravity. Much scraping or rehandling of both ore and waste-fill is obviated. Where scraping or slushing is made, a special mounting of the slusher on a turntable has been devised.

Smelter at Bunker Hill and Sullivan

Improved Working Conditions

Steps have also been taken to provide best possible working conditions at the working places. In dead end workings, or workings somewhat remote from the main ventilation air stream through the mine, air-conditioning "Spot Coolers" have been used successfully resulting in a decided improvement in working conditions. These units deliver 3500 c.f.m. of air through as much as 4,000 ft. of fan pipe to the end of long cross-cuts and raises, discharging the air at 79 per cent relative humidity as compared to 96 per cent relative humidity of the intake air. The cooling effect is due not only to the lower temperature but more so to the reduction in weight of water vapor in the air.

Underground cooling of drinking water is being accomplished by the use of International Refrigeration units in conjunction with 300-gal. storage tanks. These units are placed at stations on various levels and this cold drinking water is delivered to the various working places and materially adds to the convenience and comfort of the workmen.

Several of the mining companies have undertaken supervisory training programs for the purpose of equipping its shift bosses with the knowledge and abilities needed to handle present labor problems. The training programs stress that it is not a question of pampering or coddling men. It is the question of being fair and considerate and making the best use of the individual's ability. The results of handling men well will be instrumental in the establishment of harmonious relations all around, which cannot help but be reflected in improved operating results.

Eastern Tennessee

By H. A. COY

General Superintendent
American Zinc Co. of Tennessee

THE manpower shortage continued to be critical throughout 1945. This was particularly aggravated because of the proximity of these East Tennessee Mining Operations to the Atomic Bomb Plant at Oak Ridge, where, at its peak, nearly 80,000 men and women were employed. We continued to lose men in our underground operations until late in the year. Since then, entrances in excess of exits have been negligible.

As a result of small crews and efforts to produce the greatest possible tonnages of ore, some maintenance has suffered, particularly haulage. The present generation of miners is none too willing to dig ditches and work on sloppy tracks. The development of an efficient mechanical mine ditch cleaner, to replace hand methods, is sorely needed in mines such as these where slimes, unless kept out of ditches, cause water to overflow, with a resultant unstable trackbed.

Supervisory Training

Perhaps the most important forward step taken this year in these operations of the American Zinc Company of Tennessee was the institution of a training service for our Supervisions. The Training Within Industry Service developed by the War Manpower Commission was chosen, and the three courses of this service are being given to all Supervisors in the following sequence:

1. Job Relations Training.
2. Job Methods Training.
3. Job Instructors Training.

Already the benefits are obvious, and we have no doubt that Training of Supervisors will become an established practice in the larger mining operations.

Pumping

The use of strong chemical dyes such as uraine and fluorescein has been of great aid in locating the source of water inflow. In several instances, important volumes of water have been plugged off, after locating openings in the bed of nearby creeks, with the help of these dyes. Pumping of a dye solution into an underground crevice is also an aid in locating the source of water inflow.

The trend in mine pumping equipment is more and more towards the use of deep well pumps, automatically operated, rather than stationary underground pumps. The limited supply of men experienced in deep well hole drilling slowed up such installations during the war years.

Loading, Scraping and Haulage

The distance ore can be dragged economically occupies our attention. After the distance between the face and dumping point reaches a certain limit, we are finding it best to build a loading ramp near the face, and transfer the ore to the dumping point in cars or a skip. With rope haulage on track, and the proper placement of rollers, ore is taken (usually by gravity) over sometimes very steep and crooked stope floors, to a millhole raise or other dumping point. Manufacturers of scraper hoist equipment should recognize the occasional need of an auxiliary winch attachment to their scraper hoists for servicing such an ore transfer practice. Where they can be used, rubber tired trucks or shuttle cars, storage battery powered, would be preferable to track haulage.

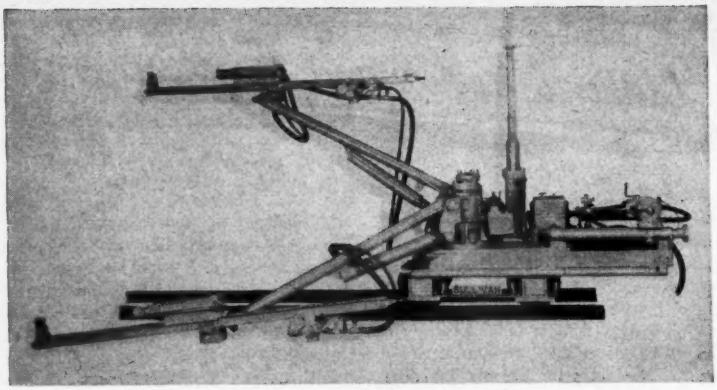
In one of our new but very small mines, we chose rope haulage in preference to electric locomotives. Installation was simple and capital investment small.

Ventilation

In the massive and irregular orebodies of the East Tennessee Zinc region, the best method found to date of ventilating individual stopes is to put small blowers on the collar of old prospect churn drill holes or to drill new holes for this purpose. Lengthy installations of fabric or metal ventubing are being discarded in favor of the surface churn drill hole method.

Drilling and Blasting

The speed of sinking inclines has been almost doubled in the past year by the use of a drill rig made by Sullivan Machinery Company known as the hydro drill jib, equipped with long feeds, power driven. Heretofore when handset drill columns were used, three men were able only to drill out



Hydro-drill jib by Sullivan

and blast a heading in a normal shift of eight hours. A second crew on a later shift did the mucking with a scraper slide. With the help of the drill jib and a scraper slide, a crew of three men now can muck, drill out, and blast a heading in one shift. Inclines are driven on a downhill grade of around 21 degrees. The best footage made to date in an incline (9 x 9 ft. in section) using these machines is 61 ft. This was made by two three-men crews in a six-day week, or during 12 consecutive operating shifts.

The same is true this last year of drifting. In a 9′ x 9′ drift, two men can muck, drill out, and blast a heading 6½ ft. deep in a normal shift, when equipped with a drill jib and mucking machine (Eimco-Finlay).

In our heading and bench method of mining, the trend is towards taking a higher or thicker slice out of the heading so that greater tonnages can be broken per hole drilled. Heretofore the height of heading has been limited to some extent by the length and weight of column that men could handle with safety. Drilling jumbos, mounted on crawler tracks, and power driven, not only will allow of a higher slice being taken out of the heading, but will speed up the drilling operation. Great progress has been made along this line by operators in the Joplin District.

General Maintenance

Metallizing of worn or scored shafts, especially deep well pump drive shafts, motor shafts, etc., is relatively new with us, but the work done has been excellent.

Open Pit

Athey and La Plante-Choate crawler type wagons, all D-8 powered, were replaced by 15-ton Euclid diesel end-dump trucks. The trucks move a substantially larger tonnage, mainly because of their speed and maneuverability, but better roadbeds are required.

Developments in the Tri-State

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By S. S. CLARKE

General Superintendent of Mines
Eagle-Picher Mining and Smelting Co.

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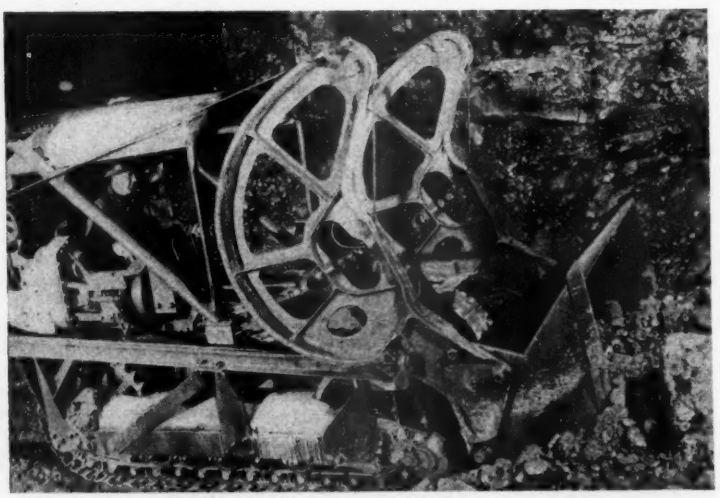
THE Tri-State District mined 7,405,000 rock tons during 1945, a reduction of 1,713,000 tons from the 1944 tonnage. Preliminary returns show approximate production to be 221,000 tons of zinc concentrates and 32,000 tons of lead concentrates yielding 3.4 per cent recovery. Tailing mills retreated 11,390,000 tons of tailings as compared to 12,293,010 tons milled in 1944. Retreated tailings produced 41,650 tons of zinc concentrates or .34 per cent recovery.

Loss of Manpower Partially Offset by Equipment Developments

Shortage of miners was the cause of lowered mine output. The exodus of miners to the armed forces and elsewhere started in January, 1944; by December, 1944, mine crews were lowered by 40 per cent. The low peak occurred in September, 1945, when crews were only 50 per cent of normal. There is now a slight gain in manpower, roughly 5 per cent gain over the low peak.

Had the Tri-State District continued to operate by the old procedure, i. e., hand shoveling, mule haulage, hand bumping and two-man drills, it is very doubtful that the district could have produced 5,000,000 rock tons.



New type of loading shovel

The necessity of maintaining peak production called for all the resourcefulness and ingenuity of the mining staffs and crews in suggesting and developing new ideas to expedite pro-

Caterpillar-mounted drill jumbos—outstanding achievement of the year

duction. The cooperation and interest displayed by the miners in perfecting and adapting new and unorthodox equipment has been highly commendable.

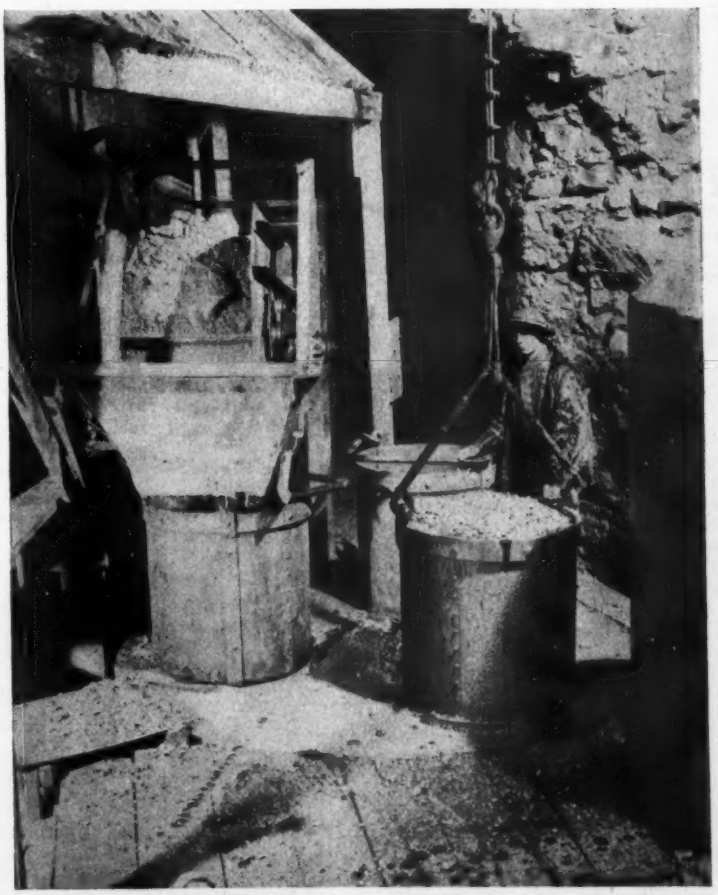
The outstanding achievement has been the successful construction of a drill jumbo mounted on a caterpillar chassis, carrying two or three drills. Some companies are using an adaptation of a wagon drill sash; the sashes developed here are 12 ft. long with chain feed powered by a small reversable air motor. Such a sash permits starting a hole with the length of drill steel that will finish a breast hole, 9 to 11 ft. in depth; and for a stope or splitter hole, two lengths of steel will bottom a 14- to 16-ft. hole.

Some 40 jumbos are in operation. They have about doubled the output per drill, and have reduced the physical effort of drilling to a minimum. As time goes on, no doubt, more improvements will be made in the design and operation of the jumbo.

A new type of shovel has recently been put in use in loading. It uses the rocker principle and is mounted on a caterpillar. This unit has only been in operation a few days, which is too early to arrive at any definite conclusions; however, it appears to function properly and experience will correct a few minor construction defects that are apparent but not serious.

The Paxson mine is experimenting with the use of Diesel powered dump trucks to supersede the storage battery trucks on long hauls.

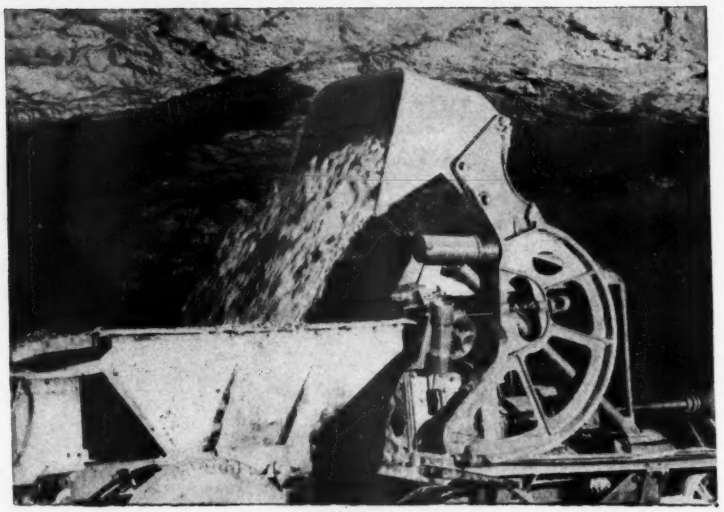
This test is creating a great deal of interest. The Government and state



Turn-table relieves task of "bumping" cans at shaft

health and mine inspection departments are cooperating in making air analyses and observations to determine if the health hazards have been removed to such an extent as to permit more universal use in mining operations.

A very ingenious piece of equipment has been developed to relieve the task of "bumping"—a term used to designate the job of pushing the loaded cans into the shaft for hooking out, and returning the empties to the lay-by or passing track. The device consists of a turn-table carrying three cans with one segment centered in the shaft. The turn-table is rotated by a small motor and equipped with an automatic brake, the ore rock is dumped into a hopper and drawn off onto a steel pan conveyor, the conveyor discharges into a can. The timing is such that the can is filled and rotated to the hoisting center by the time the empty is returned.



New type shovel discharging into car

Arizona Observations

By H. H. ANGST
Mine Superintendent
New Cornelia Branch, Phelps Dodge Corporation
Ajo, Arizona

THE increased wage scale now being paid to mine workers together with the continued manpower shortage has necessitated improvements in the types of equipment and the methods used in the mining industry in order to maintain production at reasonable cost. Among these developments are the following:

At New Cornelia

One large open pit copper mine is adopting 125-ton electric locomotives with high-powered Diesel-electric auxiliaries in place of the usual battery auxiliaries for hauling on the ore benches. The necessity of taking up the shovel loading tracks when blasting banks prohibits economical electrification of the bench tracks and therefore auxiliary power on the locomotives is needed. Due to the 3 per cent adverse gradient with loaded trains on a long haul, a 1,500-volt trolley system will be used as being more efficient than the customary 750-volt trolley system.

The loading of large churn drill holes with 50-lb. explosive cartridges safely and efficiently has been improved by the use of a powder loading machine, which has reduced the amount of time and manual labor required. With this machine two men can safely load blast holes at a speed of one 50-lb. cartridge per minute. This machine consists of a self-winding reel supported on a pipe standard and equipped with hand operated brake to control the speed of the dropping cartridge, which cartridge is suspended on a rope with automatic hook fastened to the twine hanger of the cartridge. The rope tension from the dropping 50-lb. cartridge winds a spiral spring in the reel, which automatically re-winds the rope when the cartridge is released at the bottom of the blast hole.

Transite drainage discharge pipe has come into general use in open pits where sulphurous water must be pumped.

In one large open pit copper mine Victaulic pipe couplings have become standard for water and air lines because of the facility and speed of connecting pipe joints.

Other Developments in the Field

Trackless underground mining systems of various types are being further developed and considerable advancement has been made at the gypsum mines of the Certain-teed Products Corp.

The use of a Diesel-powered locomotive with exhaust air conditioner has proved efficient in tunnel operations at the Idorado Mining Company, in Colorado.

Electric photo tubes for control equipment at mines is receiving more attention, particularly for safety devices. (Castile Mining Co.)

Trends in Milling Methods

Milling Methods and Equipment Are Ever Changing To Meet New Problems, Bringing Steady Gains in the Treatment of Ores

By A. W. SCHLECHTEN
Department of Mining and Metallurgical Engineering, Oregon State College

MILLING activities during the past year must be divided into two parts for consideration. During the early war months the only thought was the production of metal and more metal even if it meant treating low-grade material at excessive costs and with poor metallurgical results. The coming of peace called for a return to more normal operation. Mill men were required once again to judge the success of their operations solely on the basis of economic recovery.

The return of men from the armed forces has already eased the manpower situation in the mills and will assure a better supply of ore for some of the mills that have been on short rations due to a scarcity of miners. The effect of the labor shortage on tonnage treated is revealed by the performance record of the two mills of the Utah Copper Company. The average daily tonnage in 1943 was 97,187 tons, while the estimate for 1945 is an average of 67,528 tons of ore milled per day. The immediate future may be disturbed by labor troubles, with the possibility that some important operations may be shut down by strikes. An interesting sidelight on the labor situation is the statement from several mills that women workers will be released as soon as there are sufficient men to take their place, and that any attempt to keep them would lead to trouble with the unions.

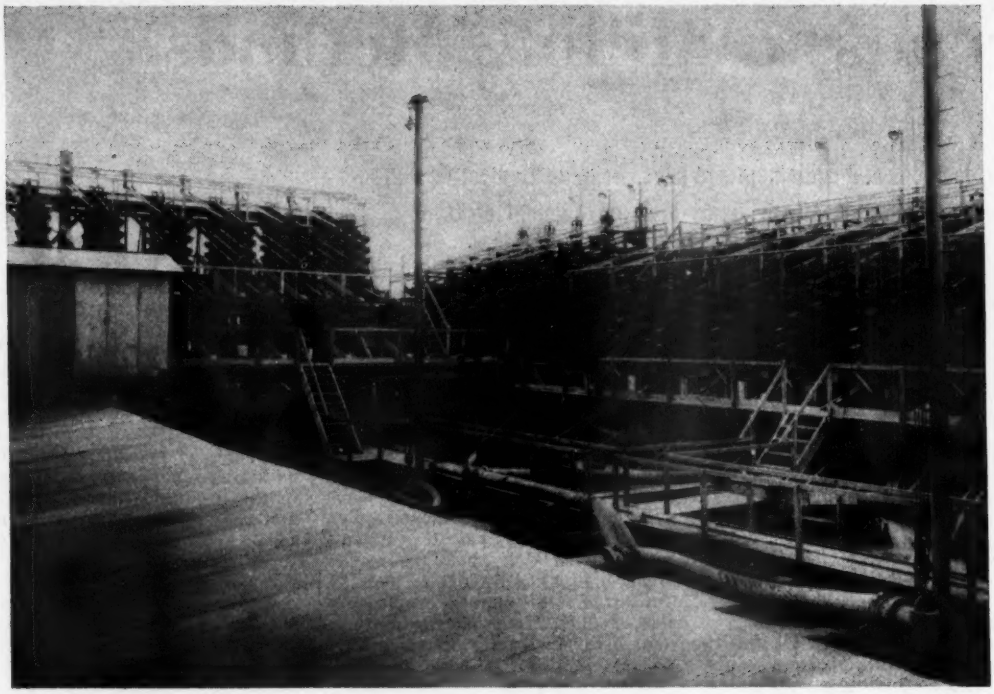
Gold operations were not resumed with full vigor after the closing order, L-208, was rescinded. It seems as though they have been held back by the high prices of labor and equipment, and in some instances, by a shortage of equipment and supplies such as filter cloths. Despite various discouragements, small outfits are again starting up their "doodlebug" dredges. It is said that there were over 200 of these dragline dredges in the United States in 1941, some of them treating as much as 4,000 cubic yards per 24 hours.

Philippine mills must wait for rehabilitation of the mines, and in some cases they will have to replace stolen and destroyed equipment. It has been reported that the Japs moved the power plant at Balatoc to Lepanto in an attempt to increase copper production. The Hausserman interests are said to be sending crews of miners and workmen to build up their properties again, but it may be some time before milling can be resumed.

The heavy density media (sink and float) process continues to find new users. It has been applied with great success to separations on fluorspar, lead-zinc, iron, and coal, and has shown promise on low-grade gold ore. Some mill operators attracted by the possibility of substantial savings have found that the sink and float separation is not feasible if the valuable constituents in the ore are finely disseminated. Nevertheless, improvement of equipment and operation is extending the range of particle size that can be treated and narrowing the density differences needed for separation.

After the closing of the Oregon chromite operations, the Humphreys spiral concentrator plant was moved to a sand property near Jacksonville, Fla., leased from the Rutile Mining Company of Florida and with the addition of more units it is being used in the production of ilmenite, rutile, and zircon concentrates. The final separations are made with electrostatic concentrators said to be of very simple design. The new spiral plant has 174 rougher units, 36 cleaners, and 12 finishing units, most of which are a new model having five turns as compared with four turns on the first installations. Five thousand tons a day are treated in a plant occupying a space 80 ft. x 112 ft. and employing only three men per shift. The rutile concentrates are sold for the manufacture of welding rod coatings and ferrotitanium, the ilmenite is used mainly for pigments, and the zircon is used for refractories. It has been demonstrated that the spirals can be used for the concentration of many ores, and a special design has been developed for the cleaning of coal. An article by Dean G. W. Gleeson explains how a combination of centrifugal action and cross sectional streaming in the spiral produces a concentrating action similar to that observed in river bends.

Women workers helped solve manpower shortage in mills



Humphrey's Gold Corporation spiral concentrator plant making rutile, ilmenite, and zircon concentrates

Mill operators welcomed the new Handbook of Mineral Dressing by A. F. Taggart to replace his Handbook of Ore Dressing published in 1927. The old volume was a standard reference in almost every mill office for many years.

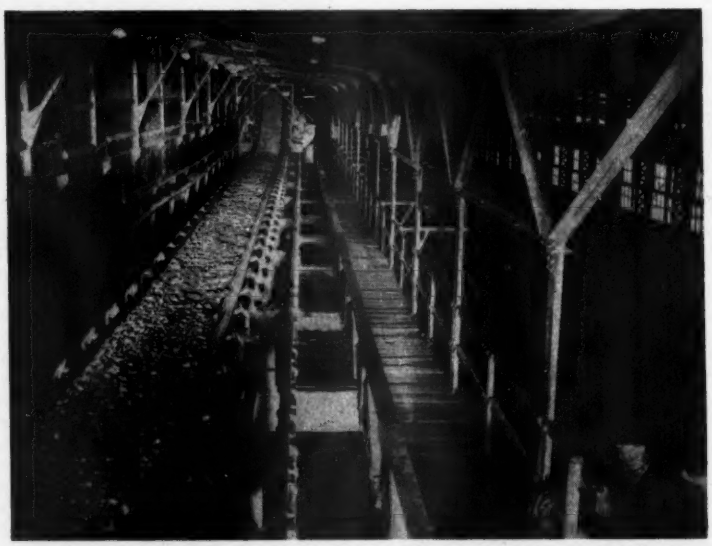
Robert H. Richards, the father of ore dressing in this country, longtime professor at M. I. T., and author of the four well-known volumes of Richards Ore Dressing, died on March 27, 1945. He had celebrated his 100th birthday in the fall of 1944, and on that occasion received the congratulations of the entire fraternity of milling men.

Crushing and Grinding

The symposium on crushing practice held by the Canadian Institute brought out the following factors that influence the selection of a crusher: (a) The probable life and ultimate tonnage of the operation. (b) The nature and size of the deposit. (c) The capital available. (d) The source and cost of power. (e) The final grind necessary. One of the papers presented at the same meeting, told of building up jaw crusher plates with a hard surface by welding while the plates were partially submerged in water to prevent warping.

Grinding of ores, particularly in ball mills and rod mills, is always of interest to the mill operator because of the great part of his milling expense that goes into that operation. A number of developments have been reported in the last year and some articles have been written summarizing the experiences of many years.

H. R. Stahl describes the substitution of rods for the ball charge in the ball mills of the Bonne Terre mill of the St. Joseph Lead Co. The rods were only 51 in. long, but no difficulty was experienced from a tangling or crossing of the rods. Two other changes were made in the ball mill operation, the customary scoop feeders were eliminated and the feed was introduced into the mill by a pipe feeder from a catch box; no attempt was made to dewater the feed to the mills as had been done previously. The net result was that with a lower consumption of grinding media, the rod mills gave a product carrying 4.3 per cent on 20-mesh and only 18.5 per cent minus 100-mesh as compared with 8 to 12 per cent on 20-mesh and 25 to 30 per cent minus



Ore conveyor over crushed ore bins in a copper concentrator

100-mesh for the ball mills. Thus the detrimental effect of sliming the galena ores was partly overcome with no great change in mill equipment. As an example of progress towards a different goal, H. R. Banks states the case for the use of smaller balls in the grinding charge and cites his experience at the Sullivan Concentrator where a change from 2-in. balls to 1¾-in. balls increased the production of 200-mesh material by 50 per cent.

The two achievements just described demonstrate only too well the real reason why there will never be an absolute standardization of milling equipment or milling procedure. No two operators seem to follow the same road to reach the ultimate goal of greatest economic recovery. It would appear that no mill man can wholly accept the experiences at other mills as applying to his own case; he is forced to make his own grinding tests under the conditions that exist in his own mill. With due acknowledgement that such a state of affairs exists, S. D. Michaelson has written a paper to show that at least an approximate idea of correct ball mill size can be determined from grindability tests. Data on grindability of an ore are obtained by laboratory tests that have been described by Maxon, Bond, and other investigators at the Allis Chalmers Company. These data are then multiplied by certain empirical factors obtained from observation of actual practice and a final figure is obtained which indicates the optimum size of ball mill for the desired operation.

The practice of sending large sized feed to the ball mill section, as typified by the Morenci Mill, appears to be losing favor. It is, of course, a question of economics; can you reduce, for example, from 1 in. to ⅜ in. more cheaply in the ball mill or ahead of the ball mill? Many mill men are advocating the use of a rod mill ahead of the ball mills to provide a smaller feed that will permit the use of smaller balls.

Admittedly a great deal of the energy expended in grinding goes into the creation of large amounts of new surface in the extremely small particle sizes. Evidently there is no hope of avoiding the creation of this sub-sieve and sub-microscopic material, as various investigators have shown that comminution of any kind produces a given number of particles in each size range according to a definite ratio. The question of what is the smallest particle created by grinding is at least of theoretical interest, and is partly answered by J. T. McCartney in a recent Bureau of Mines publication. McCartney used an electron microscope to measure fine coal particles produced by grinding that were as small as one millionth of a centimeter. This is certainly approaching the lower limit, because the smallest aggregate of atoms that could still be called coal is not less than about one twenty-fifth of that size. The determination of particle diameters by actual measurement in these extremely small sizes checked the laws governing grinding as stated by Rosin and Rammler.

Automatic Control

Improvements and new development of controlling devices encourage their adoption into mill circuits. The Pacific Mill of the Nevada Massachusetts Company obtained continuous pH control by using a Beckman Model R pH meter connected to a Bristol throttling controller which actuated a Variac which in turn controlled a Jeffrey vibrating feeder that fed soda ash into the circuit. This installation is similar to the one at the Normetal Mining Corporation, Normetal, Quebec. A continuous pH recording and control apparatus is made by Leeds and Northrup Company which is designed to operate a Syntron feeder which adds the reagent to the pulp. The Nevada Massachusetts Company also report that by using a photoelectric colorimeter in their laboratory they are able to make tungsten assays in 30 to 60 minutes.

P. L. Hendricks has designed a tramp metal detector for the Pickands Mather Company which operates on the principle of a reactance bridge. Thus it is sensitive to all conducting materials and will detect non-magnetic metals such as high manganese bucket teeth that would not trip a magnetic detector. The new Fisher Concentrator of the Republic Steel Company has a centralized automatic push button control station that starts and stops equipment in proper sequence.

The possibilities of automatic control in a mill become greater every year. New electronic devices are being developed that can be applied to practically all operations for control, measurement, or safety.

Flotation

There have been no startling developments in flotation during the last year, but there appears to be steady widening of the field of non-metallic flotation and a better understanding of the principles involved. Chemical manufacturers have made it clear that they can produce fatty acids and related compounds in great quantities if there is a demand for them for flotation reagents. A paper by Kellogg and Vasquez-Rosas suggests the possibility of using amines for the flotation of sulfides with a resulting saving in reagent costs. It is known that a number of companies are doing extensive testing on the concentration of low-grade iron ores by flotation. The results are not being made public, but if they are encouraging, it may mean an expansion of

Flotation machines in a large western mill

milling in that field. It is doubtful whether flotation alone will do as good a job on the iron ores as has been achieved by magnetic roasting and magnetic separation, but upper Minnesota has no good fuel supply for the roasting operation.

The Mine and Smelter Supply Company is making a new mechanical type flotation machine designed by A. W. Fahrenwald. It is said to embody a new feature in the dispersion of air into the pulp. A number of these machines have been sold to the Russian government. A suggestion by R. H. Ramsey to make flotation cells much larger, perhaps the size of thickeners, is very intriguing, but as far as we know no one has tried out the idea. One equipment manufacturer has declined to make a cell any larger than the 48-in. size in the belief that the larger cells would not work as well. A. W. Fahrenwald, in an article on frothers, points out that it appears that the older bubbles in a pulp have less ability to collect minerals, a phenomenon that would militate against the use of deep cells.

An excellent article by R. A. Pallanch in *Mining and Metallurgy* points out that flotation of ores is an individual problem and that facts at one plant may not be facts at another plant. He goes on to say that apparent paradoxes, such as the need for heating zinc flotation circuits at one mill but not at another, can often be explained if all the contributing factors are known.

The trends of milling methods cannot be determined by observation of the happenings during one year. It is not always clear what is occurring even if a number of years are considered; surface fluctuations, if they can be called that, obscure the deeper trends. One mill changes from ball mills to rod mills, at the same time someone else changes from rod mills to ball mills. Who can say that one is better than the other?

The one definite trend is that overall improvement of metallurgical practice enables the mill man to treat each year more difficult ores with better results.

Safety in Mining

Intensive Studies of Safe Working Methods and Equipment Hold Promise of Continued Progress

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By J. T. RYAN, JR.
General Manager
and
C. M. DONAHUE
Mine Safety Appliances Company

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IN THE postwar planning of coal and metal mining companies, it seems that safety will continue to be emphasized in the interests of efficiency and the conservation of lives and property. The progress made during war years when manpower and equipment were at a premium should serve to stimulate management and employes to greater efforts in their respective organizations to surpass previous records.

As shown in tables I and II, the accomplishments of the iron and coal mining industries under most difficult conditions may be barometers of what can be expected with more favorable factors. The reductions in fatalities in anthracite and bituminous coal mining per million tons produced are noteworthy and the downward trend is particularly good for the first 11 months in 1945 in comparison with the preceding war years.

The latest available data on metal mine accidents are for 1943. As shown in Table I, the fatalities per million manhours exposure for iron mining have decreased very favorably in 1943 over the previous two years, although an increase is shown for the injuries per million man-hours worked. In copper, lead and zinc mining, increases in both fatalities and injuries are substantially greater than in 1942. In copper mining, 55 of the 70 fatal accidents were underground and 21 of these were caused by falls of roof or walls. Similarly, falling of materials accounted for more of the non-fatal injuries than any other of the causes. In lead and zinc mines, the 28 fatalities reported occurred underground and 19 of these were caused by falling rock or ore.

Mine Fires and Explosions

In Table III it is noted that there were 6 major mine explosions in which 127 men were killed in 1942; 8 major mine fires and explosions in 1943 in which 179 men were killed; 4 major

TABLE I

	Number of Mines	Men Employed	Man Hours Exposure	Men Killed	Men Injured	Per Million Man Hours Killed	Per Million Man Hours Injured
Iron—							
1943.....	286	29,636	68,964,694	47	1,663	0.68	24.11
1942.....	327	28,956	66,992,925	56	1,579	0.84	23.57
1941.....	322	25,870	54,910,720	47	1,220	0.86	22.22
Copper—							
1943.....	175	23,700	60,689,305	70	3,506	1.15	57.77
1942.....	107	23,222	60,390,109	50	2,985	0.83	49.43
1941.....	100	21,576	55,130,086	62	2,961	1.12	53.71
Lead and Zinc—							
1943.....	405	10,588	23,281,210	28	1,433	1.20	61.55
1942.....	430	9,555	21,109,069	12	1,131	0.57	53.58
1941.....	338	8,634	16,917,070	12	992	0.71	58.64

Source: United States Bureau of Mines.

TABLE II

Period	Bituminous Number Killed	Bituminous Killed Per Million Tons	Penna. Anthracite Number Killed	Penna. Anthracite Killed Per Million Tons	Total Number Killed	Total Per Million Tons
January-November, 1945....	807	1.53	128	2.53	935	1.62
January-December, 1944....	1,071	1.727	168	2.607	1,239	1.810
January-December, 1943....	1,244	2.108	226	3.798	1,470	2.263
January-December, 1942....	1,245	2.14	226	3.88	1,471	2.30

Source: United States Bureau of Mines.

mine fires and explosions in 1944 in which 94 men died; and in 1945 there were 4 major explosions in which 63 men were killed.

Major coal mine fires and explosions attract considerable attention, although these account for a minor percentage of the total fatalities and injuries annually. The greater number of fatalities are caused by roof falls and haulage accidents. In these usually one or two men may be involved at any one time, but the total of these represents about 70 per cent of all fatalities and roof fall accidents alone about 50 per cent of the total in coal mining. The causes of these accidents are receiving constant attention and means studied for the reduction of accidents of this kind in the future.

To reduce roof-fall accidents, particular attention is being given to roof support, blasting procedures and the continued wearing of safety apparel such as protective caps and hats, goggles and safety footwear. Recently, development work sponsored by the General Re-Insurance Company and assigned to Lehigh University on a new method for testing mine roof has been done in which work an electronic device for measuring vibrations in the roof under test provides a quick and, as far as has been determined, reliable method for testing roof conditions. In the use of this equipment, vibrations are set up by striking the roof with a hammer which is spring-controlled, so that the striking force is uniform. The vibrations are picked up by a specially designed unit which converts the vibrations into an electro-motive force, which in turn is amplified by an electronic amplifier. An indicating meter is used to measure the amplified current developed initially by the vibration. With sound, unbroken roof, the vibrations are strong, which gives a high reading on the meter scale; while, with a roof that is drummy or has cracks in it, the readings would be correspondingly low, indicating a poor transmission of the vibrations. It is expected that this scientific development will provide a method of roof testing that may be applied to coal and metal mining and serve as a guide to proper roof support.

Safety Studies

During the past year, considerable attention has been given by various organizations and groups of mining men to the prevention of mine fires and in studies to protect lives and property when mine fires are started. Although explosions are still occurring, it is believed that these can be reduced further by adequate ventilation in all mines and by adequate ventilation plus rock dusting in bituminous coal mines. The extensive use of electricity underground has created many possibilities for fires, which require constant alertness to keep these to a minimum. Plans of attack and fire fighting equipment are important when fires are started so that these subjects, as well as preventive measures, are being given intensive study.

One of the more active groups in the bituminous field recently summarized their reports at the annual meeting of the Coal Mining Institute of America in December at Pittsburgh. For this purpose, six committees were formed under the general chairmanship of A. Lee Barrett, of Pittsburgh Coal Company. Under the title of "Prevention of Mine Fires from Electrical Origin" the following subjects were discussed by the chairman of each committee as follows:

"Preparation of Haulage Roads," by R. H. Nicholas, Director of Safety, Pittsburgh Coal Company, Library, Pa.

"Installation of Trolley Wires and Feeders," by C. R. Drum, Electrical and Mechanical Engineer, Jones & Laughlin Steel Company, Vesta Coal Division, California, Pa.

"Sectionalization," S. M. Cassidy, Vice President, Weirton Coal Company, Isabella, Pa.

"Automatic Protective Devices," by A. Lee Barrett, Maintenance Engineer, Pittsburgh Coal Company, Library, Pa.

"Inspection and Maintenance," by C. R. Nailler, General Manager, Hanna Coal Company, St. Clairsville, Ohio.

"Fire Fighting and Recovery Work," by J. V. McKenna, Mine Inspector, Pennsylvania Department of Mines, Waynesburg, Pa.

Each committee consists of five or six men, all of whom are well qualified and represent operating companies in different localities, State Mining Departments, Bureau of Mines and equipment manufacturing companies.

These committees have reached some conclusions to eliminate the causes of mine fires of electrical origin and a review of these may be of interest and value at this time. A summary of suggestions of the committee on the Preparation of Haulage Roads includes:

"Drive straight entries that won't have to be skipped to get straight track.

"Keep the entries at an even width and avoid gouging.

"Control blasting to avoid shattering the roof and sides.

"Erect permanent roof supports as soon as practical after the coal is removed.

"Support the cross bars well up on the sides.

"Keep the road bed well drained.

"Provide good ballast to insure good surfacing.

"Select the size rail consistent with the load to be carried.

"The main haulage entries are the foundation upon which the mine is built. Lay the initial foundation well and there will be a safe and economical mine for many years to come."

TABLE III

LIVES LOST IN COAL MINE FIRES AND EXPLOSIONS DURING WAR YEARS

	Number	Men Killed
Major mine explosions in 1945	4	63
Other mine explosions in 1945	5	10
Total	9	73
Major explosions in 1944	4	94
Other mine fires and explosions in 1944	15	20
Total	19	114
Major mine fires and explosions in 1943	8	174
Other mine fires and explosions in 1943	28	23
Total	36	197
Major mine explosions in 1942	6	127
Other mine fires and explosions in 1942	21	27
Total	27	154
Total for years 1942, 1943, 1944, and 1945	91	538

Data source: United States Bureau of Mines.

The committee on "The Installation of Trolley Wires and Feeders" emphasizes the importance of good construction, sound design, and adequate maintenance as the best means of reducing mine fires. It is emphasized that "limited voltage drop is one of the best insurances against mine fires" and that "the maximum voltage drop from sub-station to motor terminals should not exceed 20 per cent."

Suggestions are made to take care of anticipated electrical loads and for proper calculation of sub-station and distribution system capacity, which includes the trolley wire and feeder and also the track circuit. Adequate power must be available to insure safety in the operation of mine locomotives, cutters, loaders, pumps and other electrical equipment.

To reduce trolley-wire wear and dewirements as well as mechanical damage to the current collector and overhead support, it is suggested that the trolley-wire height is maintained at a uniform distance from the rail. Where physical limitations do not permit uniformity of suspension, the gradient with respect to the rails should not be greater than 2 per cent. Trolley wire guards should be provided in locations where these are needed to prevent accidents.

It is also suggested for safety that "entries must not be wired beyond the last breakthrough, that power circuits will not be permitted in return air-courses, and that rooms or working places be free of wiring."

Proper inspection and maintenance of power circuits and electrical apparatus are recommended highly to insure continuous operation of the transportation system and other equipment.

The Committee on Sectionalization has made the following tentative sectionalizing recommendations for direct current circuits:

"1. In each and every case, sufficient feeder and return circuit capacity shall be provided so that the overcurrent protection shall be tripped by a dead short circuit at the most remote point of the circuit.

"2. An overcurrent circuit breaker should be installed in the circuit between each two substations. This breaker should be installed at such a point that the resistance between each station and the breaker is approximately the same. If sufficient copper is used so that a ground at any place will trip the circuit breakers at both substations, no intermediate breaker shall be required. A sectional insulator, or so-called "dead-block," may be used between the substations instead of a circuit breaker if parallel operation with other substations is not necessary for satisfactory power service.

"3. For further sectionalizing a disconnect switch or circuit breaker should be placed at not over 1,500 ft. intervals in every power line.

"4. An overcurrent circuit breaker should be used in each circuit leaving a substation. These breakers may be of the manual or the automatic reclosing type. (Trip free operating mechanism should be used.) The exception to this is where a substation feeds the main haulage only and only one haulage unit at one time; in this case only one breaker is required at the station.

"5. An overcurrent circuit breaker shall be placed at each main branch circuit.

"6. Secondary branch circuits should be protected by an overcurrent circuit breaker. (A secondary branch circuit is a circuit feeding only one local section or territory.)

"7. Circuits to pumps or other fixed loads shall have over-current protection at their supply ends.

"8. Unimportant branch circuits such as infrequently used entries, spur tracks, etc., should have switches for cutting off all power.

"9. Each mining setup shall be protected by an overcurrent circuit breaker. In some cases it may be necessary to protect two setups by one overcurrent circuit breaker.

"10. All overcurrent circuit breaker settings shall be as low as is found practical with good operating practice.

"11. During non-operating times power shall be cut off all idle territories. Where it is necessary to run a pump or other equipment in an idle section or inactive part of the mine, special overload protection shall be provided of a capacity limited to that necessary for operation."

Proper testing and scaling of mine roof prevent accidents

Safety Requires Careful Inspection and Maintenance

In the summary of the report of the Committee on Inspection and Maintenance, work in relation to other committees is stressed and several suggested instructions are recommended. Competent men should be available for inspection and maintenance work with the inspection schedule so arranged that inspections are made at least weekly of the haulage road for combustible material; track alignment, surfacing, joints and ballast; drainage ditches; sumps; pipelines and pumps; roofs for broken or loose material; decayed or improperly set posts; soft coal under hitches; loose ribs and falls; pump, oil and foreman stations for fire-proofing and possible accumulation of any combustible materials.

Weekly inspections are also recommended of the power circuit with a visual inspection of the hangers, wire clamps, frogs, switches, feeders, bonds and trolley for temperature, tautness, clearance from combustibles, etc.; circuit breakers should be checked for the setting of the overload and also to determine that the circuit breakers function properly. Operators of equipment using trailing cables should make a continuous inspection of these and in addition a competent electrician should inspect the cables weekly for temperature and wear and remove any from service which have an excess of splices or show other unsatisfactory conditions.

Monthly inspections are recommended for all safety and sectional switches to observe the temperature, damage to or corrosion of blades to make measurements of the contact resistances as a guide for proper maintenance.

Under semi-annual and special inspections it is suggested that semi-annual inspection of circuit breakers should include a thorough inspection of mechanical parts with particular attention to be given to the wear, lubrication, cleaning and replacement of worn or broken parts. Circuit break-

ers should be protected during rock dusting after which the breaker should be cleaned and special inspections should be made after any interruptions caused by severe short circuits.

An electrical inspection semi-annually should include testing of the normal voltages, sub-station voltages, full load voltage at faces and measurements of the resistances of various sections of the power circuit. In addition switches should be covered during rock dusting then cleaned afterwards. Should the regular resistance test indicate that switches need reconditioning, they should be removed from service for this purpose. Insulators should be cleaned when the insulation values of the various sections indicate that this is necessary. All haulage equipment should be checked periodically depending upon the type and its service.

The committee on Fire Fighting and Recovery has for its purpose the determination of the best methods of fighting fires and to outline procedures for the rescue of men who may become isolated back of a fire, either in working sections or on main intakes. This committee has developed recommendations regarding the following subjects: Fire Fighting; Training of Men and Recovery Operations; Methods of Protection or Escape When no Exits for the Purpose Are Available; Means of Isolating Fires by Use of Doors and Stoppings; Fire Fighting Equipment; Underground Water Lines, and Escape by Exits to the Surface.

The members of these committees are still active on their respective assignments and when final recommendations are made, it is thought that the information will be very valuable for the mining industry in its efforts to prevent mine fires.

Personal Safety Equipment Plays Important Role

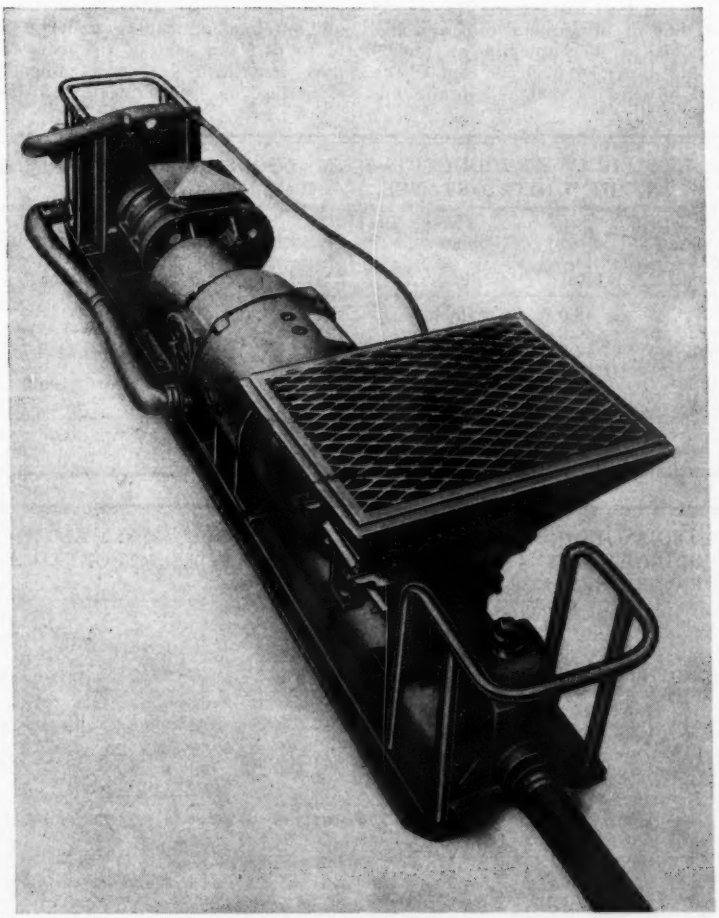
During the past year it was evident that equipment for the personal protection of underground men was extensively used and contributed much in the efforts of management and employes in keeping accidents to a minimum. Protective hats, goggles, safety shoes, safety pacs and dust respirators were particularly favored. It is particularly interesting to note that many companies publicized widely the fact that these protective devices served their purpose well when injuries were prevented by their use. Electric cap lamps have been attested as contributing to the safety and welfare of individual workers and also in the reduction of mine fires and explosions. The better light as provided for individuals by electric cap lamps permits inspection easily of existing physical conditions in working places and mining equipment which reduces minor and possibly fatal injuries in many cases.

In addition to the more extensive use of water to allay dusts, the comfort of mining machine operators has been further increased by the use of respirators designed to be light in weight, efficient in dust removal and easy fitting on the face. The reduction by the application of water of dust which would be thrown otherwise into suspension also reduces the possibility of coal dust accumulations in bituminous mines. In conjunction with the proper application of rock dust, this use of water in turn reduces the possibility of a coal dust propagation in case of either a gas or coal dust ignition. During the year there has been more extensive use of rock dust, the application of which has been made easier by the development of newer, more effective and more economical rock dust distributors. One model which can be easily transported has been developed for adequately maintaining rock dust in the working places particularly on shuttle car and conveyor sections.

Newer methane detectors have permitted more testing for methane and have helped in safer and more efficient distribution of air in gassy mines.

More mining companies are taking advantage of the mechanical devices for the personal protection of workers and of more efficient and safer mechanical equipment, all of which contributes to the prevention of injuries and fatalities, with better production and lower production costs.

The substantial reduction in fatalities from all causes particularly in both anthracite and bituminous mines shows that definite progress was made during the war years in the conservation of life. With the high rate of coal production this is an exceptionally fine tribute to the officials and workers who shared their efforts in this accomplishment. The educational work of various organizations including Federal and state inspection departments, vocational schools, mining extension services of colleges and training facilities of many operating companies contributed to a large degree in this fine safety achievement. With the continued activity of all groups interested in the safe production of coal and ore, even better results should be obtained in the post war years.



Portable rock duster for mechanical mining

Sales of Mechanical Loading and Cleaning Equipment—Coal Mines

By W. H. YOUNG* and R. L. ANDERSON*

SALES of mechanical loading and cleaning equipment showed a decided upturn in 1945 following the low record registered in last year's reports. In terms of capacity, mechanical loading equipment sold in 1945 for underground use in all coal mines was 25 per cent greater than the sales in the previous year.

Mechanical cleaning equipment installed at bituminous mines was 87 per cent greater, in terms of capacity, than installations made during 1944.

Sales of "mother" or haulage conveyors are shown for the first time in this report of 1945 sales.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal mines and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines, together with data from various trade journals.

* Messrs. Young and Anderson are chief and assistant chief, respectively, of the Bituminous Coal Section, Bureau of Mines, U. S. Department of the Interior. Printed with permission of the Director of the Bureau of Mines.

Mechanical Loading of Bituminous Coal, Anthracite, and Lignite

During 1944 there were 274,189,132 net tons of bituminous coal and lignite loaded mechanically at underground mines, or 52.9 per cent of the total bituminous coal and lignite underground output. In the same year Pennsylvania anthracite mines loaded 14,975,146 net tons mechanically at underground mines, or 35.8 per cent of the total anthracite underground output.

Table I shows bituminous coal and lignite production by methods of mining and mechanical cleaning for the years 1943-1945, inclusive. Preliminary estimates for 1945 show the combined tonnage mined by stripping and mechanical loading underground to be 64.1 per cent of the total output. Practically all coal mined by stripping is mechanically loaded;

TABLE I. BITUMINOUS COAL AND LIGNITE PRODUCTION BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1943-1945, INCLUSIVE

	1943		1944		1945*	
	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total	Thousands of net tons	Percent of total
Surface stripping	79,685	13.5	100,898	16.3	106,000	18.4
Hand loaded underground	260,687	44.2	244,489	39.5	207,000	35.9
Mechanically loaded underground	249,805	42.3	274,189	44.2	263,000	45.7
Total production	590,177	100.0	619,576	100.0	576,000	100.0
Mechanically cleaned	145,576	24.7	158,727	25.6	150,000	26.0

* Preliminary

TABLE II. UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS COAL, ANTHRACITE, AND LIGNITE MINES FOR UNDERGROUND USE IN THE UNITED STATES, AS REPORTED BY MANUFACTURERS, 1938-45, INCLUSIVE

	1938	1939	1940	1941	1942	1943	1944	1945	Percent change, 1945 from 1944
Type of equipment:									
Mobile loaders	241	292	233	368	352	234	286	359	+25.5
Scrapers*	10	26	39	11	29	15	39	26	—33.3
Conveyors†	990	1,311	1,762	2,130	1,491	1,100	708	861	+21.6
Pit-car loaders	139	2	3	10	2	1	—	‡	—
Total, all types	1,380	1,631	2,037	2,519	1,874	1,356	1,033	1,246	+20.6
Number of manufacturers reporting	29	31	32	32	28	24	22	25	—

* Reported as scrapers or scraper haulers and hoists.
† Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads. Sales of both loading heads and shaker conveyors were counted for the years 1938-41, inclusive, but the figures for 1942-45, inclusive, do not include loading heads separately.
‡ Discontinued canvass of sales of pit-car loaders in 1945.

therefore, the total tonnage mechanically loaded in 1945 was approximately 64 per cent of the total output.

In 1928, the first year complete figures were available on mechanical loading, about 8 per cent of the total output of bituminous coal (4 per cent from underground mines and 4 per cent from strip mines) was loaded mechanically and 92 per cent loaded by hand.

Types of Units Sold.—Table II shows the number of mechanical loading units sold for use in underground bituminous coal, anthracite, and lignite mines as reported by manufacturers for the years 1938-1945, inclusive.

There were 359 mobile loaders sold in 1945, an increase of 73 units, or 25.5 per cent, over the previous year. This was the second largest number of mobile loaders sold in any one year to date. The record year was 1941 when 368 units were sold.

Sales of scrapers dropped from 39 in 1944 to 26 in 1945, a decrease of 33.3 per cent.

Conveyor sales were 861 in 1945 compared with 708 in 1944, an increase of 21.6 per cent.

During the past three years only three pit-car loaders were sold, two in 1942 and one in 1943, with no sales reported in 1944; therefore, the canvass of sales of pit-car loaders was discontinued in 1945.

Regional Distribution of Sales.—Table III shows the number of mechanical loading units shipped to the various states and regions during 1945. Types of equipment shipped are shown by letter symbol in approximate order of capacity. For example, 53 mechanical loading units were shipped to Alabama. In this total number of units sold, mobile loading machines (indicated by "L") furnished the largest addition to capacity, followed by conveyors ("C") and scrapers ("S"). Capacities are based on actual performance as reported

TABLE III. TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1945.
(L—Mobile loading machines; S—Scrapers; C—Conveyors)

State and Region	Number of units of all types shipped in 1945	Types of equipment in approximate order of capacity in 1945
Northern Appalachian States:		
Michigan	2	C.
Ohio	38	L.C.
Pennsylvania	177	L.C.
Southern Appalachian States:		
Alabama	53	L.C.S.
Kentucky	180	L.C.
Tennessee	41	C.L.
Virginia	64	C.L.
West Virginia	395	L.C.
Middle Western States:		
Illinois	41	L.C.
Indiana	13	L.C.
Trans-Mississippi States:		
Arkansas, Iowa, and Oklahoma	17	C.S.
Colorado	32	C.S.
Montana and Utah	26	L.C.
New Mexico and Washington	3	L.C.
Wyoming	11	C.
Total bituminous and lignite	1,093	L.C.S.
Pennsylvania anthracite	153	C.S.L.
Grand total	1,246	L.C.S.

TABLE IV. SALES OF MECHANICAL LOADING EQUIPMENT IN 1945 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use as reported by mine operators									Number of machines sold as reported by manufacturers in 1945
	1936	1937	1938	1939	1940	1941	1942	1943	1944	
Bituminous and lignite mines:										
Mobile loading machines	980	[1]	1,405	1,573	1,720	1,985	2,301	2,525	2,737	349
Scrapers	106	[1]	117	131	116	109	93	83	87	6
Pit-car loaders	1,851	[1]	1,392	873	697	607	481	321	241	[2]
Conveyors equipped with duckbills or other self-loading heads	234	[1]	346	559	656	788	1,062	1,226	1,331	[3]
Hand-loaded conveyors—number of units	936	[1]	1,526	1,834	2,263	2,807	3,041	3,191	3,236	[3]738
Anthracite mines (Pennsylvania):										
Mobile loading machines	[4]	[5]	[5]	[5]	[4]	[4]	[4]	[4]	[4]	10
Scrapers	[4]504	539	545	535	[4]547	[4]505	[4]524	[4]515	[4]503	20
Pit-car loaders	[6]	[5]	[5]	[5]	[6]	[6]	[6]	[6]	[6]	[2]
Conveyors equipped with duckbills or other self-loading heads	[6]	[5]	[5]	[5]	[6]	[6]	[6]	[6]	[6]	[3]
Hand-loaded conveyors—number of units	[6]1,790	[5]1,855	[5]1,831	[5]1,997	[6]2,189	[6]2,432	[6]2,491	[6]2,701	[6]2,807	[3]123

[1] Data for 1937 not available for bituminous and lignite mines.
[2] Discontinued canvass of sales of pit-car loaders in 1945.
[3] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[4] Mobile loading machines are included with scrapers.
[5] Mobile loading machines, pit-car loaders, and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[6] Pit-car loaders and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.

TABLE V. COMPARISON OF MECHANICAL LOADING EQUIPMENT AND "MOTHER" CONVEYORS IN ACTUAL USE IN 1944 WITH SALES REPORTED IN 1945, BY STATES AND REGIONS

State and region	Mechanical loading equipment: Mobile loaders In use in 1944	Mobile loaders Sales in 1945	Scrapers In use in 1944	Scrapers Sales in 1945	Conveyors [1] In use in 1944	Conveyors [1] Sales in 1945	"Mother" conveyors [2] In use in 1944	"Mother" conveyors [2] Sales in 1945
BITUMINOUS AND LIGNITE MINES								
Northern Appalachian States:								
Maryland	....	...	...	...	32	...	...	2
Michigan	....	...	...	...	5	2	...	2
Ohio	161	18	...	...	203	20	27	4
Pennsylvania	583	80	12	...	833	97	84	15
Southern Appalachian States:								
Alabama	91	14	47	2	394	37	70	3
Kentucky	212	54	...	...	504	126	76	21
Tennessee	13	1	...	...	133	40	21	8
Virginia	61	12	...	...	111	52	11	5
West Virginia	674	130	4	...	1,308	265	243	56
Middle Western States:								
Illinois	587	23	...	...	25	18	25	17
Indiana	164	7	...	...	....	6	1	1
Trans-Mississippi States [3]	191	10	24	4	1,019	75	86	3
Total bituminous and lignite	2,737	349	87	6	4,567	738	644	137
ANTHRACITE MINES								
Pennsylvania	[4]	10	[4] 503	20	[5] 2,807	123	[6]	5
Grand total	[6]	359	[6]	26	[6]	861	[6]	142

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[2] Includes all haulage conveyors with capacities over 500 ft. except main slope conveyors.
[3] Includes Arkansas, Colorado, Iowa, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, and Wyoming.
[4] Mobile loaders included with scrapers.
[5] Includes pit-car loaders and duckbills or other self-loading conveyors.
[6] Data not available.

by mine operators for the year 1944. There were 1,093 mechanical loading units of all types shipped to bituminous coal and lignite mines and 153 units to Pennsylvania anthracite mines in 1945.

In addition to the 1,246 units of mechanical loading equipment shipped to coal mines in the United States, a few units were shipped to foreign countries in 1945.

Types of Mechanical Loading Equipment Sold Compared With Units in Use.—Table IV shows the trend in demand for different types of equipment. At bituminous coal and lignite mines, the number of mobile loaders in use increased from 980 in 1936 to 2,737 in 1944, while scrapers showed little change and pit car loaders in use decreased from 1,851 to 241 during the same period. Conveyors equipped with duckbills or other self-loading heads increased more than five-fold in number of machines in active use during the period 1936-44. Hand-loaded conveyors in active use increased from 936 in 1936 to 3,236 in 1944. There were 738 conveyor units sold in 1945, or 16.2 per cent of the total number (hand-loaded and self-loading combined) in use in 1944.

Pennsylvania anthracite mines have shown little change in number of mobile loaders and scrapers in use during the 9-year period 1936-44, varying from a low of 503 to a maximum of 547.

Conveyors of all types and pit-car loaders in use at Pennsylvania anthracite mines increased from 1,790 in 1936 to 2,807 in 1944.

Types of Equipment Purchased by Regions.—Table V shows the number of mobile loaders, scrapers and conveyor units shipped into various states and regions in 1945 and the number of units in actual use in 1944. West Virginia received the largest number of mobile loaders with Pennsylvania, Kentucky, and Illinois following in the order named. Pennsylvania anthracite mines received 10 of the 359 mobile loaders shipped in 1945.

There were 26 scraper units sold in 1945, the bituminous mines receiving six and the anthracite mines 20.

TABLE VI. NUMBER OF MOBILE LOADERS IN USE IN BITUMINOUS COAL AND LIGNITE MINES, BY STATES AND REGIONS, SUBDIVIDED BY TYPES OF LOADING, IN 1944

State and region	Number of mobile loaders: Loading direct into mine cars	Loading on to conveyors	Loading into rubber-tired trucks	Total number in use
Northern Appalachian States:				
Ohio	119	16	26	161
Pennsylvania	447	32	104	583
Southern Appalachian States:				
Alabama	36	35	20	91
Kentucky	123	10	79	212
Tennessee	4	...	9	13
Virginia	52	5	4	61
West Virginia	582	8	84	674
Middle Western States:				
Illinois	476	28	83	587
Indiana	131	...	33	164
Trans-Mississippi States [1]	147	14	30	191
Total	2,117	148	472	2,737

[1] Includes Colorado, Iowa, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, and Wyoming.

West Virginia received 265, or 35.9 per cent, of the total number of conveyor units sold to bituminous mines in 1945. The next largest number was shipped to Kentucky with Pennsylvania, Virginia, and Tennessee following in the order named.

Supplementary Haulage Equipment

"Mother" Conveyors.—For the purpose of this survey a "mother" or haulage conveyor is defined as a sectional, extensible, power driven conveying unit with a capacity to take over 500 ft. of conveyor.

Sales of "mother" or haulage conveyors have been included in the 1945 survey for the first time. Table V shows the number in use in 1944 and the sales in 1945.

West Virginia received 56 "mother" conveyors, or 41 per cent of the total sales to bituminous mines.

No estimates have been made on the capacities of these "mother" or haulage conveyors and they are not included in any of the summaries of mechanical loading equipment.

Trackless Gathering Equipment.—Sales of shuttle cars or rubber-tired self-powered haulage units increased in 1945 over 1944. Deliveries were made in 13 states in 1945 with West Virginia receiving the largest number and Pennsylvania, Kentucky, Indiana, and Illinois following in the order named. During 1944, 19 per cent of the bituminous coal handled by mobile loaders was loaded into rubber-tired trucks and 4 per cent was loaded onto conveyors for the initial phase of transportation. The balance of the mobile-loader tonnage (77 per cent) was loaded directly into mine cars.

Table VI shows the number of mobile loaders in use in bituminous coal and lignite mines in 1944 by states and regions and types of loading. There were 472 mobile loaders loading into rubber-tired trucks. Each mobile loader requires one to three rubber-tired trucks; therefore, there were approximately 950 rubber-tired trucks in use in bituminous mines in 1944.

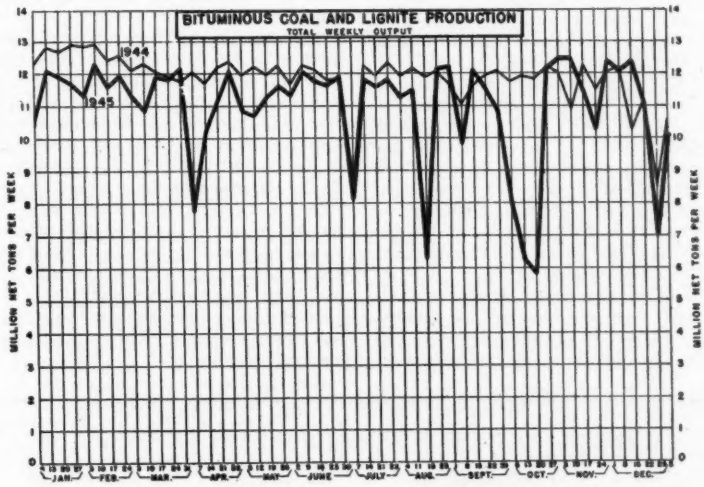
Mechanical Cleaning of Bituminous Coal

Sales of Mechanical-cleaning Equipment for Bituminous Coal.—Reports on sales of bituminous coal-cleaning equipment from 14 manufacturers show that installations were made in 11 states in 1945 as compared with 12 states in 1944; however, the total capacity of 1945 installations was 87 per cent greater than that of 1944.

Total capacity of bituminous coal-cleaning equipment sold in 1945 was 10,100 net tons of cleaned coal per hour as compared with 5,400 net tons capacity sold in 1944. Some of this equipment sold in 1945 will not be placed in operation until early in 1946. In terms of capacity about 50 per cent of the installations were made at mines as additions to or replacements of equipment at mines that already had cleaning plants and the other 50 per cent were made at mines that had no cleaning facilities. West Virginia ranked first in terms of capacity of new installations in 1945 followed by Illinois, Kentucky, Indiana, and Pennsylvania in the order named.

Wet methods of coal cleaning include piston- or common-type jigs, Baum-type jigs, concentrating tables, launders and upward-current classifiers, and any combination of these four methods. During 1944 about 87 per cent of the total bituminous coal cleaned was cleaned by wet methods. Approximately 90 per cent of the capacity of 1945 sales of cleaning equipment was wet methods.

Pneumatic methods of coal cleaning include air tables, air flow, air sand, and any combination of these three methods. About 13 per cent of the total bituminous coal cleaned in 1944 was cleaned by pneumatic methods. About 10 per cent of the total capacity of cleaning equipment sold in 1945 was pneumatic methods.



Iron and Steel Scrap

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Steel Ingot and Casting Production Totaled 80 Million Short Tons in 1945; Immediate Post-War Scrap Consumption Estimated at 40-44 Million Tons

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DESPITE the decrease in steel production following the termination of hostilities in Europe and the Pacific, steel ingot and casting production in 1945 reached virtually 80 million short tons. Data with regard to 1945 scrap iron and steel and pig iron consumption are not complete, but the steel ingot tonnage for the year indicates a consumption of approximately 25 million long tons of purchased scrap, 30½ million tons of home scrap, and 54½ million tons of pig iron for use in steel and iron furnaces. The above estimates are based upon the weighted average ratio of home scrap to purchased scrap to pig iron over the past eight years, an average from which no year's proportions have deviated by more than 3 per cent.

The generally accepted estimate for immediate postwar annual ingot steel production is 65-70 million net tons. If this estimate is accepted the probable consumption of metallic ferrous raw materials in steel and iron furnaces in these years will be 40-44 million tons of scrap and 39-42 million tons of pig iron.

Consumption

Preliminary figures on scrap and pig iron consumption for 1945 based on monthly figures through August appear to present a slightly different pattern from that prevailing during the previous years. From 1937 to 1944 (inclusive) the percentages of home scrap have shown an irregular but fairly consistent increase in relation to the total metal charged, and the percentage of purchased scrap has declined. In the 10 months from November, 1944, to August, 1945, the percentages of home scrap and pig iron have tended to decrease, while the percentage of purchased scrap has regained substantially half the loss experienced in the period 1937-44. As scrap and pig iron prices have remained substantially unchanged since 1942 it is not probable that price has been the governing factor in the trends noted above. It seems more probable that availability of pig iron resulting from the expansion of producing facilities, and of home scrap consequent upon largely expanded production and fabrication of steel, have been the major causes.

Generation

The recovery of scrap by dealers and auto wreckers has always been an important contribution to the tonnage of this material offered for sale. In 1943 this scrap salvage constituted 45 per cent of the purchased scrap, in 1944, 37 per cent, and in the first 8 months of 1945, 41 per cent. The accompanying table shows the relation of production of scrap by manufacturers and railroads to the salvage at dealers' and auto wreckers' yards, which are the three most important sources of purchased scrap.

It will be seen that salvage by dealers and auto wreckers is the largest single source of purchased scrap. It seems also pertinent to call attention to the fact that both in tonnage and percentage the salvage of scrap in 1943 was appreciably higher than it has been since. The probable explanation is that by the end of 1943 the dealers had largely exhausted sources of "dormant" scrap and have since been more dependent on salvage of current scrap.

Stocks

Table II shows the status of stocks on December 31, 1944, and on August 31, 1945.

The total decrease in stocks during the first 8 months of 1945 was virtually 571,000 tons, of which suppliers' stocks decreased by 392,000 tons and consumers' stocks by 179,000 tons. The largest loss among the suppliers was by dealers, whose stocks decreased 378,000 tons. Auto wreckers' and manufacturers' inventories declined while those in the hands of railroads increased 11,000 tons. Consumers' stocks of home scrap decreased by 88,000 tons and purchased scrap by 91,000 tons.

The changes in 1945 follow the pattern set in the last 4 years. The total year-end stocks in the hands of suppliers and consumers have been declining irregularly since these data were first recorded in 1939 and have done so consistently since the 1942-peak. Table III presents the respective mid-year stocks for 1939-45 and a calculated figure representing the number of weeks these stocks would have supplied the industry at the average consumption rate for the year.

Stocks have been reduced to a seriously low level as a result of high wartime requirements.

TABLE I—PRODUCTION AND SALVAGE OF SCRAP

	By manufacturers		By railroads		Dealers' and auto wreckers' yards	
	Long tons	Per cent	Long tons	Per cent	Long tons	Per cent
1943	7,941,000	35.46	2,957,000	13.21	11,494,000	51.33
1944	8,474,000	40.81	3,279,000	15.79	9,013,000	43.40
1945:						
Jan.-Aug.	5,641,000	39.13	2,363,000	16.47	6,342,000	44.21

TABLE II—STOCKS OF SCRAP IRON AND STEEL ON DECEMBER 31, 1944 AND AUGUST 31, 1945, IN LONG TONS

	December 31, 1944	August 31, 1945
Suppliers:		
Dealers	1,107,232	729,229
Auto wreckers	28,203	23,928
Railroads	191,013	202,396
Manufacturers	147,200	126,200
Total suppliers	1,473,648	1,081,753
Consumers:		
Purchased	2,654,000	2,563,000
Home	1,297,000	1,209,000
Total consumers	3,951,000	3,772,000
Grand total	5,424,648	4,853,753

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In deference to trade usage steel ingot tonnages are given in this paper in short tons, and scrap iron and steel and pig iron in long tons.

One other factor in the decline of stocks has been the export of large quantities of steel products, the scrap from which is beyond the reach of domestic scrap collectors. Materials that will not be sources of scrap include steel and steel products shipped to Allies, sunken ships, materials irretrievably lost in combat, and other manufactured products similarly dissipated.

Accumulations at army depots in the various war theaters offer a future source as the matériel is scrapped. How rapidly this scrapping will take place and when cargo space will be available it is impossible to predict.

TABLE III—MIDYEAR STOCKS OF IRON AND STEEL SCRAP, 1939-45, IN LONG TONS

	Stocks	Supply in weeks
1939[1]	7,302,000	11.4
1940	6,750,000	8.8
1941	5,830,000	5.7
1942	4,859,000	4.8
1943	6,916,000	6.7
1944	5,991,000	5.8
1945	4,847,000	4.7

[1] As of December 31, 1939. Midyear stocks for 1939 not available.

It is understood, however, that carbon-steel scrap from Italy and the Pacific is being shipped now. Data as to the quantity of this movement are not available currently. True "battlefield iron and steel scrap" is reported to be so small as to be of little significance. It seems, therefore that stocks must be replenished from current industrial production, more especially because the wartime demands have largely exhausted sources of "dormant" scrap.

Prices

Published prices of scrap have varied very little during 1945, but have held at or close to OPA ceilings. No. 1 Heavy Melting held at $20 a long ton through the first 11 months of the year and dropped to $19.75 in December, ending the year at this figure. On the other hand, basic pig iron was quoted at $23.50 in January and the first two weeks of February, at $25 from the middle of February until the middle of October when the price increased to $25.75, which level was maintained throughout the remainder of the year.

Alloy Steel Scrap

The war has posed the problem of the absorption of large tonnages of alloy steel scrap of special analyses which have no counterpart in peacetime products. Much of this scrap, however, is overseas.

In normal times the disposal of alloy steel scrap is not too complex to be handled in the usual course of industry. The alloy steel manufacturer is generally willing, and at times anxious, to buy back alloy scrap steel of his own manufacture and to purchase other alloy scrap of guaranteed analysis. This situation prevails whether the alloy scrap comes from the engineering steels or from specialties such as stainless, tool, or high-speed steels, and is operative today.

However, the requirements of war have changed the alloy steel scrap situation profoundly, both quantitatively and qualitatively. In the period 1929-39 the production of alloy steel amounted to 1 to 4.5 million tons a year and accounted for 5 to 7 per cent of the steel melted, whereas in 1943 (the peak year) the production of alloy steel rose to over 13 million tons or 15 per cent of the steel produced. In 1944 the corresponding figures were 10½ million tons and nearly 12 per cent.

In spite of the fact that large quantities of alloy steel have been shipped out of the country, there remains the problem of the absorption of domestic scrap alloy steel of the types special to war products which have no counterpart in our normal economy and cannot be absorbed into industry through the usual channels. An outstanding example is tank armor, but many, if not a majority, of the military steels fall into this category. How to utilize this type of scrap is a problem by no means solved today; the answer will depend largely upon technological developments within the steel industry.

It is understood that at present it is the policy of the Army either to stock-pile alloy steel scrap for disposal by other agencies as in Germany and Japan, or to dispose of this material locally as in allied countries. A committee of steel and scrap experts has recently visited Europe to study the scrap problem of the armed forces; so far the report of this committee has not been released.

It can be seen that the alloy scrap problem will be difficult to solve and that its effect on the scrap market is now unpredictable. The problem will be more serious if alloy scrap from the war areas is shipped back to the United States.

Government Regulations in 1945

On August 29, 1945, War Production Board Order M-24-c was revoked and scrap was allocated to consumers under the provisions of Order M-21. The general allocation of scrap was discontinued on October 1; some allocation continued, however, where OPA regulations required it.

On April 9, 1945, Amendment 2 to Office of Price Administration Maximum Price Regulation 4 was issued covering maximum prices for export scrap, differentials for various grades of railroad scrap, and certain other minor changes. On October 8, Amendment 3 was issued making two corrections in the regulation, increasing certain trucking charges and tightening mixed shipment provisions.

The year 1945 was difficult for the suppliers of scrap for several reasons. The sources of dormant scrap had been largely exhausted in the scrap drives of the preceding years; large quantities of steel and steel products had been exported from the United States, and the resultant scrap had passed beyond the reach of the scrap dealer; the year was one of declining steel production; and reconversion had not advanced to a point where the decline in scrap generation had been arrested. In the face of these difficulties, the scrap industry was able to supply consumers at a rate that permitted melting 80 million tons of steel ingots, a tonnage never achieved before the war.

Gold

(*Continued from page 54*)

fered by the domestic gold mining industry, operators are busily engaged in placing properties back into shape, dewatering mines, rehabilitating plants and equipment and getting ready to resume normal operations as quickly as possible. This is well illustrated by the long-range program which the operating companies in the Cripple Creek Mining District have set up. Plans include the rehabilitation of plants and equipment, the installation of labor saving devices, and the start of a long-range development program to take advantage of the benefits derived from the Carlton Drainage Tunnel. Gold producers have a firm belief in the future of the industry and faith that it will rise again to the strong position it always held from the birth of our nation until the entry on October 8, 1942, by the War Production Board of the United States, of the unjust, unnecessary and useless Order L-208.

Nonferrous Scrap and Secondary Metals

Decline in Industrial Activity Reflected in Reduction of Output by Secondary Metals Industry. Secondary Lead Recovery Shows Increase

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OPERATIONS in the nonferrous secondary metals industry declined in 1945, with the exception of secondary lead recovery, as the end of hostilities permitted a slackening of the pace the Nation's industry had maintained since early in 1942. The production and utilization of large quantities of aluminum and brass scrap, induced by the war production program, were abruptly reduced after V-J Day, with the result that recovery of secondary aluminum, copper, and zinc showed slight declines from the 1944 level. However, activity in the secondary lead field increased slightly over the previous year, as the War Production Board (and its successor, the Civilian Production Administration) sought to offset the declines in mine production and imports of primary lead through the best possible utilization of secondary sources.

Reduction in Scrap Handled in 1945

The decline in industrial activity during the summer of 1945 was immediately reflected in the transactions of nonferrous scrap-metal dealers, particularly in shipments of aluminum and copper-base scrap to consumers. Shipments of these two types of scrap, which had reached an all-time peak in March 1945, declined rapidly after that month. Even with the high rate of operations in these two metals during the early months of the year, total scrap shipments were lower than those during 1944. In contrast, dealer shipments of lead, tin, zinc, and nickel scrap were higher during 1945 than in the previous year, so that the total volume of scrap handled showed only a slight reduction.

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Scrap Stockpiles

The supply of most grades of nonferrous metal scrap was tight throughout the year—the principal exceptions being zinc-base and aluminum scrap, which were slow moving in scrap-dealer channels and were sold at relatively low prices after the March trade peak. The principal factor influencing the supply-demand balance in copper-base scrap was the Army's stockpiling program on cartridge brass, gilding metal, and free-cutting rod brass. From mid-July to early December, lots of these materials originating in Army installations and in plants working on Army contracts, which had been declared surplus and met specifications, were melted down into slab for storage. At the end of the year the melting program was discontinued, but the material was still being stockpiled in scrap form, under the provisions of Surplus Property Regulation 17. The loss of this volume of scrap kept the copper scrap market in balance, so that prices remained at ceiling throughout the year, in spite of the lower demand resulting from reduced industrial activity.

Dealer transactions in aluminum scrap for some months had been limited virtually to material for which there was a ready market, such as castings and forgings, turnings, and segregated alloy sheet. The saturation point in inventories of wrecked aircraft in dealers' yards had long since been reached, and the action of the Surplus Property Administration on October 25, 1944, in ruling that bids below $25 a ton for this scrap would be rejected, effectively slowed its accumulation by dealers. As a consequence, large unsold tonnages were transferred to the Office of Metals Reserve, and the quantity of wrecked aircraft scrap in Metals Reserve Storage yards increased steadily during the year, totaling approximately 21,500 tons at the end of October.

Copper and Brass

There was little doubt at the end of the year that the quantity of secondary copper recovered from scrap during 1945 would prove to be materially less than the 950,942 short tons recovered from all types of scrap in 1944. Production of all types of copper and copper-alloy products was drastically reduced by mid-summer, and the reclamation of copper from scrap in refined metal, in brass and bronze as ingot, brass mill shapes, or castings, and in other ways during the year was expected to total only about 800,000 tons. Copper-base scrap of all types available for remelting during the year totaled about 1,150,000 tons, compared with 1,407,860 tons consumed in 1944.

From all indications, the ratio of old scrap to new scrap used was about the same as in the previous year, or about 48 to 52. Large quantities of new production scrap, which were generated in the last big spurt of the ammunition program early in 1945, were still being consumed late in the year, as the process of depipelining the vast war industries took place. On the other hand, the supply of old scrap items, such as fired cartridge cases and railroad car boxes, also was good.

This differentiation between old and new scrap is of great importance in correctly analyzing figures on the recovery of secondary metals. New scrap is that generated in the production of finished products and includes such items as brass clippings, rod ends, turnings, and skimmings. Such material is regarded as being practically the same as recycled scrap, even though it enters normal commercial channels in moving from the producer back to the consumer, and thus does not constitute an element of the available supply of metal. On the other hand, the melting of articles of old scrap, which have served their usefulness in the shape of a finished product, makes just as effective a contribution to the available metal pool as does the production of primary metal from ore. In this connection, it might be mentioned that recovery of copper from old scrap in recent years has amounted to almost half as much as that produced domestically from ore, while total recovery from both old and new scrap has been surprisingly close to domestic primary copper production.

Trends in Scrap Consumption

Brass ingot makers produced approximately 380,000 short tons of ingot containing about 310,000 tons of copper during the year. As was the case in 1944, a little larger percentage of this copper content was primary copper than is normal. Brass and

bronze ingot is usually made with very little primary copper added. The demand for ingot and the scarcity of certain high-grade items of scrap during the early months of the year necessitated using substantial quantities of primary copper, the total used for this purpose being approximately 34,000 tons, compared with 46,533 tons in 1944. However, according to the statistics of the Copper Branch, Civilian Production Administration, receipts of primary copper shapes by ingot makers, which in January amounted to 11.6 per cent of their ingot shipments, were reduced each month, amounting to only 0.7 per cent in October. Apparently, the brass and bronze ingot business has reverted to its normal usage of scrap as a raw material.

Obtainable data are as yet incomplete, but it is indicated that the total quantity of refined and unalloyed copper produced from scrap will be considerably less than the 102,135 tons recovered in 1944, which was itself lower than the 137,883 tons recovered in 1943. This would indicate that the trend of scrap consumption is away from copper smelters and refiners and toward such consumers as ingot makers, brass mills, and foundries.

Although brass mills had reached a record peak of production in March, their activity declined sharply after that, and the recovery of secondary copper in brass mill products during 1945 was not expected to exceed 300,000 tons, a figure considerably below the 509,153 tons recovered by that industry group in 1944. This decline is attributable entirely to reduced demand for product, since the brass mills worked under blanket allocations for scrap and experienced little difficulty in obtaining a working supply.

Final figures are expected to show also that the other users of copper-base scrap, such as foundries, chemical plants, aluminum ingot makers, etc., reduced their consumption in a comparative degree, since all industry was geared to war production and experienced difficulty in reconverting to peacetime products.

It is of interest to note that the tonnage of fired cartridge and shell cases disposed of by the Army during 1945 was almost as large as in 1944, despite the stock-piling program. War Department sources reported sales of 123,000 short tons through October 1945, compared with approximately 135,000 tons in 1944. Even as late as the middle of December, bids were being received on lots which evidently did not meet the high standard set for material to be stock-piled. In addition, the Army reported the sale of approximately 110,000 tons of other copper and brass scrap in 1945, most of which probably originated in plants working on Army Ordnance contracts.

Shipments of copper-base scrap to consumers by scrap metal dealers during the year were approximately 484,000 tons, or about 3 per cent lower than the 501,493 tons handled in 1944. As in the past, the greater portion of this scrap went to ingot makers, since they consume most of the scrap that enters dealer channels. The other large scrap consumer group, the brass mills, have contracts with their customers under which fabrication scrap is returned to them for credit. Consequently, a large part of the scrap used by brass mills comes directly from the producer and does not pass through the dealer's hands. Analysis of the figures from monthly reports of nonferrous scrap dealers reveals that the peak of dealer activity in copper-base scrap, in March, coincided with the peaks of production in brass and bronze ingot and in brass mill products. The decline in dealer shipments after that date occurred first in the small portion of brass mill scrap handled by dealers, then, as the ingot maker operations declined, dealer shipments of composition and bronze scrap were also reduced.

Lifting scrap anodes from tank to go to remelt, at Great Falls

Dealers Stocks of Copper-Base Scrap

Dealers' stocks of copper-base scrap remained at about the 45,000-ton level all through 1944 and the first half of 1945, except for the period around January 1, when unusually severe weather in the entire northeastern industrial area hampered deliveries of scrap to consumers, and inventories rose to 51,726 tons. Starting with May, stocks began to climb slowly and were 57,925 tons at the end of October. This absorption of additional material by dealers was accomplished without any accompanying weakening of the price structure, which is, of course, a clear indication that the dealer trade can support the normal inventory of approximately 70,000 tons of copper scrap. Individual dealers have, in fact, expressed disapproval of the manner in which Government stock piles have been handled, stating that the dealer is the natural stock-piling medium and that the market would

become more stable if legislation now being debated in the Congress stated that Government stock piles were to be made inviolate except in the case of a national emergency. The American Mining Congress took the same viewpoint with regard to metals and minerals as a whole, viewing the use of "administrative discretion," in the matter of handling material, with some misgiving.†

As stated above, prices of practically all grades of copper-base scrap remained at ceiling level throughout 1945, and there was no indication at the end of the year that supplies would increase to the extent necessary to cause a break in the market. However, all transactions were being conducted with the prospect of strikes in many industries constantly in mind. For instance, even though brass mills use less copper scrap from dealer channels than do ingot makers, a crystallization of current labor unrest in the Connecticut brass mills would undoubtedly affect the market adversely.

Aluminum

The abrupt termination of hostilities in August, resulting in an almost complete cancellation of the aircraft construction program, had an immediate reaction on the production and use of aluminum scrap. As a consequence, the gross weight of aluminum scrap melted in 1945—about 336,000 short tons—was somewhat less than the 354,182 tons used in 1944. Recovery of secondary aluminum from this scrap is estimated at about 305,000 tons compared with 325,645 tons in the preceding year. During the latter part of the year, also, there was a change in the type of scrap treated, especially by the secondary aluminum ingot makers—turnings and borings, which had been plentiful, were not being generated in such huge quantities, and more of the alloy sheet and clippings and scrap castings and forgings became available, probably as a result of cancellation of contracts.

Aluminum Recovery Methods From Scrap

The tonnage of old scrap melted increased approximately 12 per cent over the 1944 figure of 22,899 tons. A good part of this increase is credited to operations at naval air stations, where crashed and war-weary aircraft were being melted down into salable ingot by naval personnel. This system of recovery of aluminum from wrecked aircraft scrap, which has been worked out by the Navy, is perhaps the most economical method of utilizing the huge reserve of this material. Large sloping-hearth reverberatory furnaces are used in the process, the scrap being piled on the hearth for melting. The aluminum alloys melt off and trickle down into the bath, while the other elements in the scrap are not melted so readily and are subsequently raked from the furnace. Aluminum alloys accumulating in the bath are soaked for some time, allowing iron in solution to settle to the bottom because of its greater specific gravity, and the product drawn from near the top of the bath is low enough in iron to permit its reuse, mainly by primary aluminum smelters in alloys of the same general type.

Another process for using wrecked aircraft scrap was developed at the plant of the Aluminum Ore Company in East St. Louis, which consisted of chemical leaching of the aluminum from aircraft frames and incorporation of the resulting alumina with that from bauxite, so that final recovery was made in the form of virgin aluminum ingot. This process, however, did not prove economically feasible, as was proved by exhaustive operating cost determinations made jointly by Alcoa and Army engineers.

It was found during the war years that strict segregation of aluminum scrap at the source, by type of alloy, provided the most satisfactory means of recovering aluminum from scrap, and the system of segregation has been followed faithfully by the producers of scrap, even since WPB controls making segregation mandatory were lifted. Thus, no difficulties arise regarding the utilization of properly segregated scrap, even though the quantity finally resulting from the efforts of the Surplus Property Administration to liquidate materials from contract terminations may prove to be enormous. The big problem is still wrecked aircraft scrap, for although the Navy Department is taking the necessary steps to dispose of its share, there remains a considerable quantity already in yards of dealers and of the Office of Metals Reserve, together with additional amounts to be generated from Army salvage operations.

Shipments of Aluminum Scrap

Shipments of aluminum scrap to consumers by scrap dealers last year amounted to about 154,000 tons, which was slightly less than the 156,804 tons they shipped in 1944, and almost half of the total amount of scrap received by consumers. Dealers' stocks of aluminum scrap, which were 55,812 tons on January 1, declined to 49,865 tons at the end of August, then climbed to about 54,000 tons at the end of the year. The market for this material was slow throughout the year, and there is every indication that the figures quoted above represent the approximate limit of dealer inventories, or rather, the dealers' ability to absorb aluminum scrap. Certainly such inventories appear enormous when compared with prewar dealer stocks of about 4,000 tons.

Although aluminum scrap sold at far less than ceiling prices throughout the year, it was not included in the OPA action of August 30, which suspended price controls on primary aluminum ingot; nor was secondary aluminum ingot included. A related action by the Surplus Property Administration removed large amounts of scrap from the market and thus prevented a price decline, by establishing minimum prices for the sale of scrap by that agency. Under this Regulation 12, any scrap which did not bring bids of the level set was turned over to Metals Reserve for stock-piling and thus had no effect on the current market.

Zinc

Recovery of secondary zinc in 1945 showed a slight decline from the preceding year, with preliminary estimates indicating the recovery of about 320,000 short tons compared with 345,469 tons in 1944. Although recovery from zinc-base scrap gained somewhat, the loss in reclamation from copper-base scrap more than sufficed to show an over-all decline. In 1944, 38 per cent of the secondary zinc recovered came from zinc-base scrap, while it was anticipated that final 1945 figures would show that over 40 per cent came from this source.

Consumption of zinc-bearing flue dust and chemical residues declined approximately 28 per cent, from 58,214 tons used in 1944 to about 42,000 tons in 1945, but this deficit was apparently balanced by increased use of other zinc scrap items. Total consumption of zinc-base scrap promised to exceed 200,000 tons by a small margin, compared to 199,000 tons reported used in the preceding year. Treatment of galvanizers' dross increased late in the year, reflecting the diversion of slab zinc supplies to galvanizing, after the curtailment of brass mill activities.

Recovery of zinc from scrap by distillation was slightly lower than in 1943. The secondary zinc content of redistilled slab declined from 49,037 tons in 1944 to approximately 48,400 tons in 1945, while the secondary zinc content of zinc dust produced during the year totaled only 23,800 tons, compared with 26,511 tons in 1944. A source of an increasing quantity of high-grade zinc alloy scrap was the forming dies used in the aircraft industry for stamping aluminum sheet. The top section of these dies is antimonial lead and the bottom Kirksite, a zinc alloy. Even before the end of the war, consumers were in the market for this material, and the indications are that considerable quantities will be marketed as the aircraft plants dispose of obsolete dies.

† "Threat of Surplus Metals" by Julian D. Conover, secretary, American Mining Congress, in *"Metals,"* monthly supplement to *Daily Metal Reporter*, November, 1945.

All controls on the uses of zinc and zinc scrap having been lifted in 1944, trade during all of 1945 was unrestricted, except for adherence to price ceilings. Dealers' buying prices of new zinc clippings held at 6 cents a pound all year, 1.25 cents under the ceiling, although low-grade zinc scrap items experienced a much weaker market value after the peak of demand in March.

As has been the case in the past, most of the metallic zinc scrap was supplied to consumers by dealers, while the greater part of the drosses and residues moved directly from industrial sources to users. Shipments of all zinc scrap to consumers by dealers during 1945 totaled approximately 53,000 tons, a sizable increase over the 42,771 tons shipped in 1944.

Lead

Recovery of secondary lead from scrap experienced a gain in 1945, totaling about 341,000 tons, according to preliminary figures, compared with 331,416 tons in 1944. This advance was made possible by increased smelting of battery plates and utilization of drosses and flue dust, as the supply of the higher-grade solid scrap items, such as soft lead and solder, was below that of the previous year. Both dealers and consumers were plagued with labor difficulties which made breaking up old batteries a problem; but even so, the tonnage of battery-lead plates smelted was higher than in 1944.

A new source of antimonial lead scrap came into the market in the latter half of the year—aircraft die scrap. It was indicated that thousands of tons of this material would be turned back into secondary lead production as aircraft manufacturers disposed of obsolete forming dies. In addition, a campaign of the Tin-Lead-Zinc Division of the War Production Board to unearth additional usable lead scrap resulted in the shipment of large tonnages of low-grade drosses, residues, and flue dust from secondary smelters in the East to smelters of primary lead in the West, where the lead content was recovered to increase the supply of primary lead.

The smelting of battery plates resulted in the consumption of approximately 269,000 tons in 1945, a gain of 9 per cent over the 246,258 tons used in 1944; and over 75,000 tons of drosses and residues were processed—a creditable gain over the 63,576 tons treated in the preceding year. The use of soft lead, common babbitt, and solder scrap declined from the 1944 level, while consumption of hard lead, cable lead, and type metals remained about the same. Total consumption of lead scrap exceeded 455,000 tons during the year, compared with 429,261 tons in 1944.

Shipments of lead-base scrap and residues to consumers by scrap dealers totaled about 298,000 tons in 1945, with peaks of activity in March and June. This represents a gain of 6 per cent over total shipments during 1944 and is a good indication of the ability of the entire group to respond when pressed for supplies. Dealers' stocks of lead scrap were highest at the end of January as a result of the unusually severe weather and declined slowly until the end of June, after which they gained slightly.

General Preference Order M-38 was one of the few WPB orders retained by the Civilian Production Administration when that body took over the functions of the War Production Board. This order, which effectively controls the uses of lead, is still necessary because of diminishing supplies, both from domestic mine production and from imports. It certainly will be amended further early in 1946, because available supplies of lead are insufficient to meet current demand, and uses must be restricted further to bring about a balance. An additional action was taken on October 24 to guard against possible hoarding of lead- and tin-base scrap by dealers, by the issuance of Direction 5 to Priorities Regulation 32, which prohibited dealers from accepting delivery of such scrap unless they had disposed of an amount at least equal to their current inventory within the preceding 60 days.

Ceiling prices of lead scrap were unchanged during 1945; and owing to steady demand, dealer buying prices were at a high level throughout the year. Prices for battery plates ranged from 2.62 cents to 2.87 cents a pound, with smelting charges running $25 and $26 a ton most of the year.

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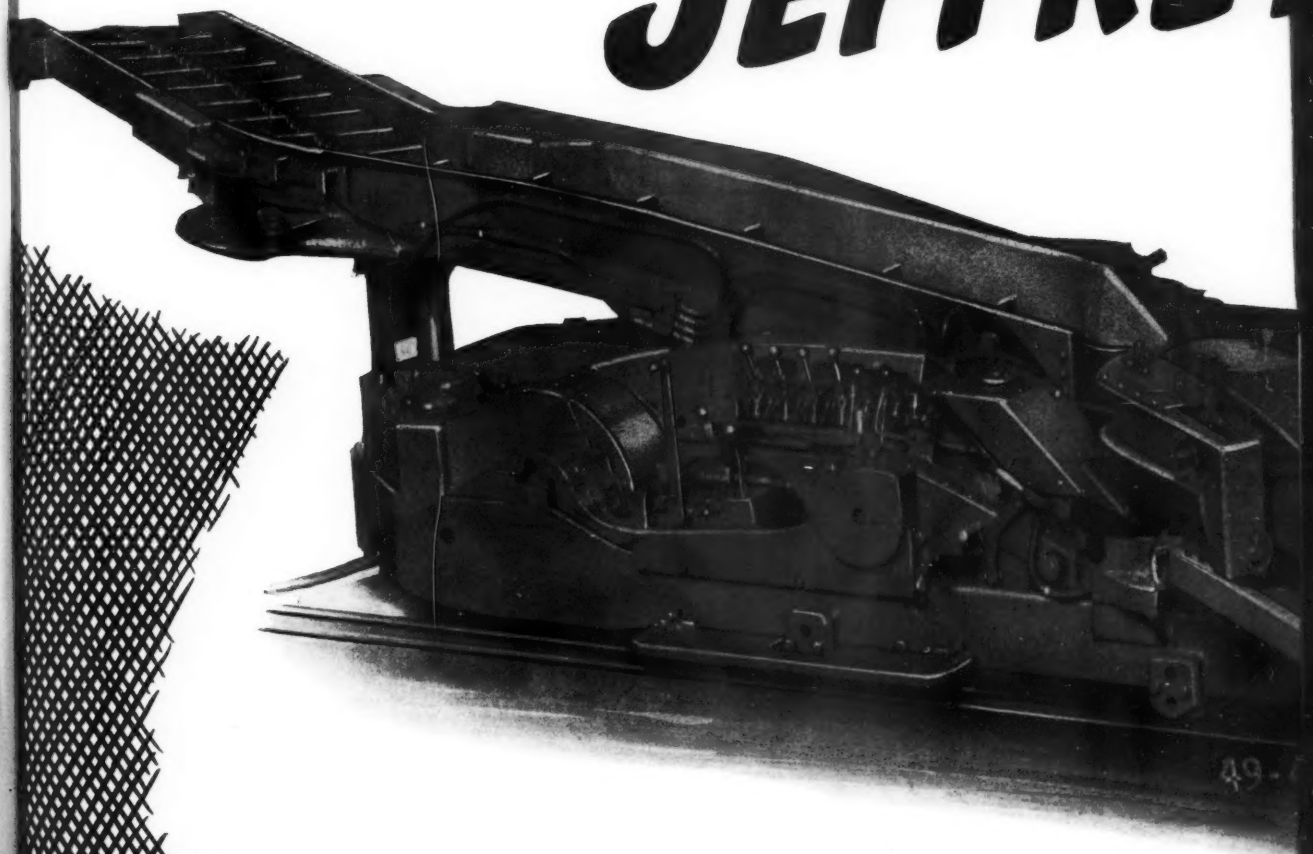

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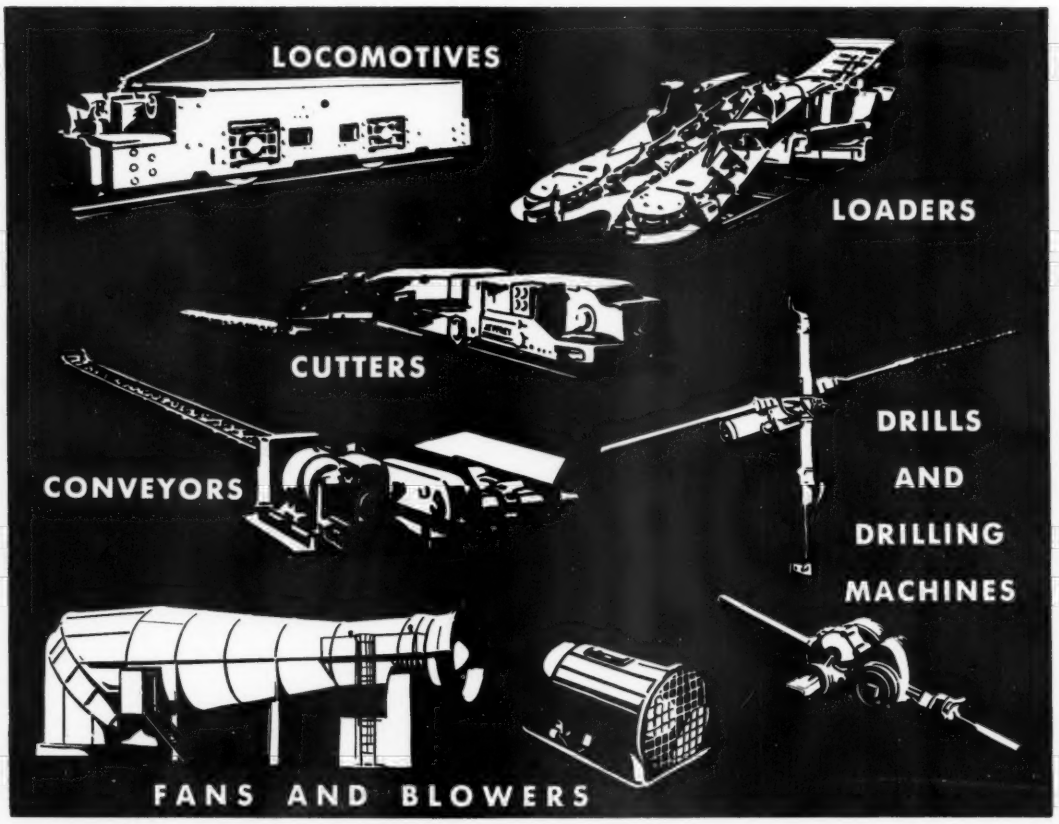

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WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THUS far the Second Session of the 79th Congress has been marked chiefly by a stifling filibuster in the Senate against the bill to set up the so-called "Fair Employment Practices Commission." The advocates of this questionable legislation are becoming convinced that it cannot prevail and the Senate will now resume normal operation. On the House side of the Capitol labor legislation has held the center of the stage, with the Administration's Fact-Finding bill as the focal point of the drive for anti-strike legislation occasioned by the serious industrial disturbances threatening the country's reconversion program.

Critical Labor Situation

White House policy in the critical wage situation has been notably circumspect. Federal seizure has been avoided in the three weeks' steel strike, now approaching a settlement, as well as in the long drawn-out General Motors work stoppage. In the meat packing strike and in the New York harbor tugboat strike Government seizure was necessary and was promptly undertaken.

In connection with the approaching steel settlement a change is forthcoming in the Administration's wage-price policy, in the setting of an overall "across-the-board" formula for wage increases and compensatory price adjustments.

Advocacy of "fact-finding" by the Administration has been sharply criticized by representatives of both labor and management. In the course of Senate hearings, Charles E. Wilson, president of General Motors Corporation, pointed out that management and labor can settle their differences, if the Government will clarify its policy on wages and prices and stay out of the numerous controversies. In commenting on the undesirability of the fact-finding policy he said, "You'd have government running both labor and industry. It would be so close to compulsory arbitration by the Government that you might as well adopt that and have it over with."

Case Bill

The House Labor Committee reported the Administration's Fact-Finding bill in late January, after deleting the subpoena power and the 30-day "cooling off" period provision. The Rules Committee, however, permitted House floor consideration of a bill by Representative Case, of South Dakota, as a substitute. This is a strong measure, which instead of fact-finding sets up a tri-partite board to mediate labor disputes and provides a total of 30 days before a strike may become effective. Strong feature is that requiring that collective bargaining contracts "be mutually binding and enforceable either at law or in equity against each of the parties thereto." Both unions and employers are subject to damage suits or injunction proceedings for contract violation. Forcible picketing or organized boycotts would be penalized by denial of collective bargaining status and reemployment rights. Foremen are definitely recognized as representatives of management by denying them the status of "employes" for the purposes of Sections 7, 8 and 9 of the National Labor Relations Act.

Adopted by a vote of 258 to 155, following a week of hot debate and the offering of many amendments, the Case bill now goes to the Senate.

"Full Employment"

House approval has been given to the conferees' report on the "Employment-Production Act," which has been substituted for the Administration's "Full Employment" bill. As the measure now stands it calls for an annual economic report by the President to Congress, setting forth the trends in employment, production and purchasing power, and presenting his recommendations. The declaration of policy in the bill now reads: "It is the continuing policy and responsibility of the Federal Government . . . to foster and promote free competitive enterprise and the general welfare, conditions under which there will be afforded useful employment opportunities, including self-employment, for those able, willing, and seeking to work, and to promote maximum employment, production and purchasing power." The harmful guarantee and "right to work" features are gone.

Washington Highlights

CONGRESS: Slowed up by F.E.P.C. filibuster.

WHITE HOUSE: Wrestles with wage strife.

CASE BILL: House approves anti-strike measure.

"FULL EMPLOYMENT": Replaced by moderate "Employment Production Act."

U.S.E.S.: House insists on return to States June 30.

WAGE-HOUR: Bill boosting minimum wage on Senate calendar.

OPA: Administration driving to extend to June 30, 1947.

TAX: Subcommittees may consider tax and Social Security.

STOCKPILING: House Military Affairs Committee expected to report S. 752.

GOLD: Further hearings on Engle restitution bill Feb. 14 and 15.

U. S. Employment Service

The tilt between the White House and Congress over return of the U. S. Employment Service to the States continues. Following the President's veto of the $51 billion rescission appropriation bill in late December, because it carried a rider returning USES to the States within 100 days, a new bill was introduced under which Federal control would continue to June 30, 1947. On the House floor this measure was amended to terminate control June 30, 1946, and its further disposition is now up to the Senate.

Wage-Hour

Now on the Senate calendar is the Pepper Minimum Wage bill, increasing the minimum wage under the Fair Labor Standards Act from 40 cents

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to 65 cents an hour, increasing to 70 cents after two years and 75 cents two years later. The Senate Committee on Education and Labor dropped a very dangerous feature of the original bill, which would have given the Wage-Hour Administrator power to fix wage differentials between "inter-related job classifications." The five-year limitation for employes' suits for back pay is reduced to two years in the pending bill. The Gwynne bill now on the House calendar would limit such suits to one year.

A startling expansion of the coverage of the Fair Labor Standards Act is indicated under the Supreme Court decision in the case of the Roland Electrical Company of Baltimore. The employes of the company were engaged in the repair of electrical equipment used by manufacturing companies in Maryland who were engaged in production of goods for interstate commerce. The Court ruled that workmen whose jobs are necessary to the production of goods that will go into interstate commerce are covered by the act, even though the employing company is not directly engaged in interstate commerce. Under this ruling thousands of employers may be faced with claims dating back to October, 1938.

OPA Extension

Of pointed interest to metal producers is the Spence bill, H. R. 5270, now the subject of hearings before the House Committee on Banking and Currency, which would extend the Price Control and Stabilization Act to June 30, 1947. Included in the measure is the continuation of subsidy payments by the RFC on copper, lead and zinc in the form of premium price payments. Extension of the Premium Price Plan was carried last year in the bill S. 502, which authorized the payments on copper, lead and zinc through June 30, 1946. In the new bill there is no "non-cancellable" provision similar to that carried by S. 502.

Senator McFarland, of Arizona, however, has introduced S. 1815 to continue the Premium Price Plan to June 30, 1947, with payments authorized in an amount not to exceed $50 million. All classes of premiums are non-cancellable and cost to the Government is reduced by increasing the maximum price for each metal by an amount not less than 60 per cent of the initial premium of 5 cents per pound for copper, 2.75 cents for lead, and 2.75 cents per pound for zinc. It is provided that new classes of premiums may be added if deemed necessary to meet the cost of operation.

The bill has been referred to the Committee on Banking and Currency. Co-sponsors of the measure are Senators Murray of Montana, Hayden of Arizona, Johnson of Colorado, Thomas and Murdock of Utah, Taylor of Idaho and Hatch and Chavez of New Mexico.

Taxation

In the House Committee on Ways and Means stress is laid on the necessity of giving early consideration to Social Security legislation, but minority members of the committee continue to press for a tax reduction measure as well. Representative Harold Knutson, of Minnesota, ranking minority member, has a bill pending to repeal the wartime increases in excise taxes on July 1—a measure which would reduce revenues an estimated $600 million. There is discussion of arranging for subcommittees to work simultaneously on Social Security and a tax bill.

Encouraging is the assertion of President Truman in his budget message that for the first time since 1930 no increase in the national debt will be required. This is based on the statement that expenditures for fiscal 1947 are scheduled at $35.8 billion; net receipts estimated at $31.5 billion; and the difference of $4.3 billion to be met by a reduction in the Treasury balance during 1947.

The 742-page report on "Issues in Social Security" recently made public by the Ways and Means Committee, as the work of its technical staff, suggests an increase in the payroll tax rate on employers and employes for old age benefits (now frozen at 1 per cent each) of one-half of 1 per cent every ten years, beginning with 1947 until a 3 per cent rate is reached in 1977.

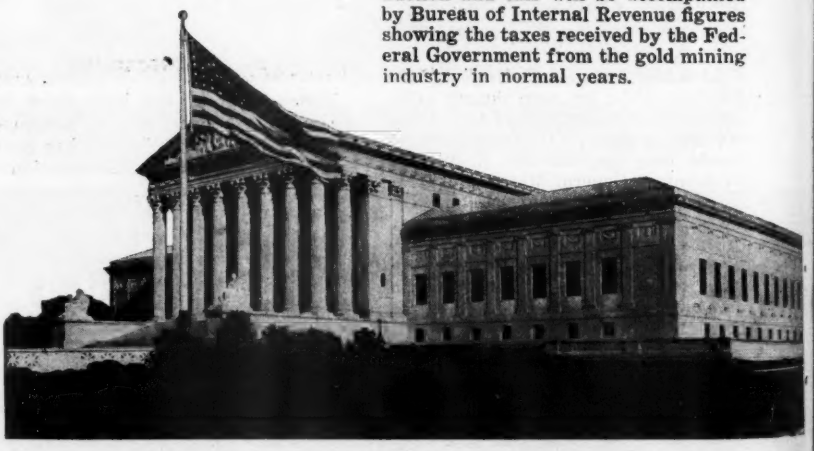
Senator George's Joint Committee on Internal Revenue Taxation has just completed three days of hearings on Treasury administration of excess profits tax relief under Section 722. The committee received testimony from tax attorneys and accountants. Ellsworth C. Alvord, chairman of the Committee on Federal Finance of the U. S. Chamber of Commerce, explained to the committee that the administrative difficulties arising over the relief section have been largely a matter of the "generally negative attitude of the Bureau toward the section." Alvord offered numerous suggestions for improvement of the present situation which will be considered by members of the Bureau staff. The Bureau will later render a report to the Joint Committee.

Stockpiling

The busy House Committee on Military Affairs has under consideration the Thomas-May stockpiling bill, S. 752, discussed in last month's issue. On February 5 Harold Stein, representing Director John W. Snyder, of the Office of War Mobilization and Reconversion, and Secretary Julian D. Conover, of the American Mining Congress, appeared before the committee. Mr. Stein explained that the Government departments are in accord with the provisions of the bill, as approved by the Senate December 20, and recommended its early enactment without amendment. Mr. Conover stated that the mining industry's chief concern is that stockpiles be held inviolate as a protection against war; that it is necessary for Congress to retain control over stockpiles and that no administrative agency should have the power to use or release them for other than war purposes without specific Congressional approval. He stated that the mining industry agrees with the OWMR that the bill should be reported and enacted without amendment. The committee is expected to act on the measure in the near future.

Engle Gold Bill

Additional hearings are scheduled February 14 and 15 before the House War Claims Subcommittee on Representative Clair Engle's (Dem., Calif.) bill, H. R. 4393, to reimburse gold producers for their out-of-pocket losses resulting from the WPB shutdown order, L-208. Ten or more additional witnesses from the gold mining states of the West will present testimony reciting their experiences under the shutdown order. Full data will be presented on the estimated cost of bringing the gold mines back into production and this will be accompanied by Bureau of Internal Revenue figures showing the taxes received by the Federal Government from the gold mining industry in normal years.



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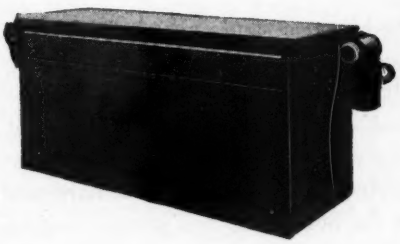

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High operating flexibility is also obtained with battery-powered shuttle cars. Being self-contained units, they can take the shortest practical route from face to loader and back. No time is lost in making and breaking external power connections or round-about maneuvering to avoid running over them. They are also easiest to keep in working order because they have the minimum number of working parts.

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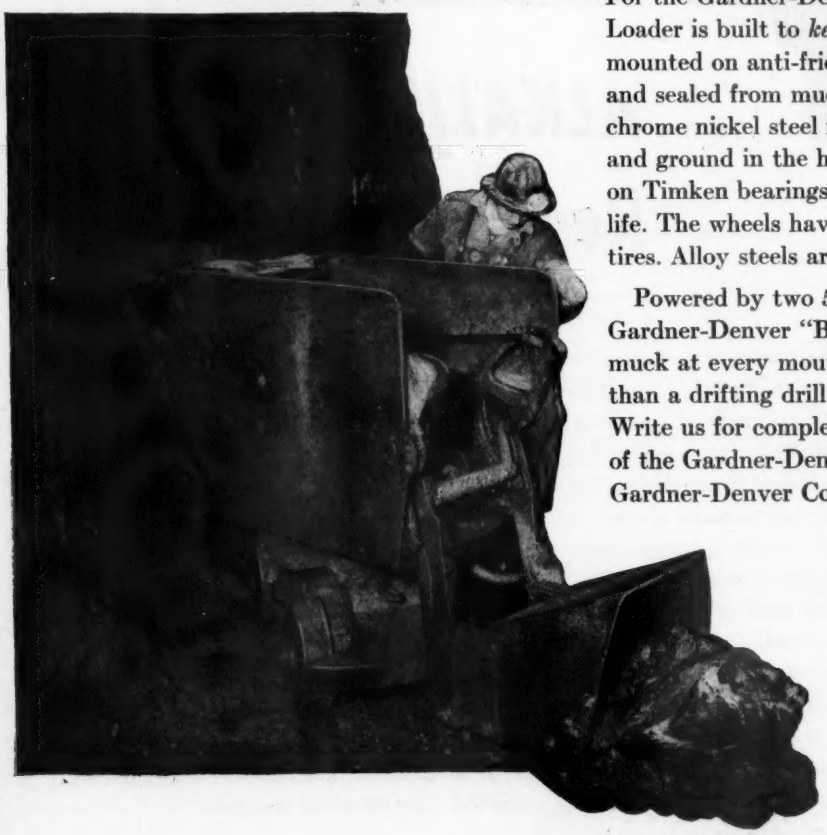

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Personals

E. H. Snyder, president and general manager, Combined Metals Reduction Company, was elected president of the Utah Metal Mine Operators Association at its recent annual meeting succeeding **F. A. Wardlaw, Jr.**

James W. Wade, president and general manager, Tintic Standard Mining Company, was elected first vice president. **O. N. Friendly,** vice president and general manager, Park Utah Consolidated Mines Company, will act as second vice president and **James Ivers,** vice president and general manager, Silver King Coalition Mines Company, will be third vice president. **A. G. Mackenzie** was re-elected manager of the association.

Samuel M. Cassidy has resigned his post as vice president of Weirton Coal Company to become vice president of Consolidation Coal Co., in charge of its Kentucky mines. Mr. Cassidy has been succeeded at Weirton by **George M. Rigg,** who goes from assistant manager to vice president. Mr. Rigg has been with the company since 1925. His headquarters will be at Uniontown, Pa.

W. F. Shinners, of Hibbing, Minn., has been named superintendent of the Mesabi Range Iron Ore Properties of the M. A. Hanna Company.

Effective January 1 **Raymond Mancha** joined the Joy organization to become, after the contemplated merger of the Joy-Sullivan-Ladel combination, the vice president in charge of ventilation of the combined unit. Mr. Mancha was formerly manager of the Ventilation Division, Jeffrey Manufacturing Company, Columbus, Ohio.

Frank H. Brooks, superintendent of Mine No. 25 at Clarksburg, W. Va., for Consolidation Coal Company, was transferred on January 1 to the same position at Arkwright Mine, Morgantown, W. Va. He succeeds E. D. Gall, who resigned to devote full time to other business interests. Mr. Brooks will be succeeded at Mine No. 25 by **George W. McCaa,** a graduate mining engineer of Lafayette College, Easton, Pa. McCaa joins the Consolidation organization as superintendent. **Leon Wilson** was promoted from position of section foreman to mine foreman at Mine No. 25 on January 1, simultaneous with the appointment of Superintendent McCaa.

Carl E. Newton has resigned as president of the Chesapeake and Ohio Railway Company, effective April 23, to return to his law business in New York. Prior to his appointment as C. & O. president, Mr. Newton was a member of the New York law firm of Donovan, Leisure, Newton and Lumbard.

The following promotions have been announced by the Utah Copper Company: **C. G. Quigley,** assistant superintendent since 1939 of the Arthur Plant, has been promoted to superintendent. **Louis Buckman,** who has been general superintendent of mines since 1938, was appointed general superintendent of operations and will maintain his headquarters at Bingham. **Harvey L. Garrity,** formerly mine superintendent at Bingham, has been advanced to superintendent of mines. **Roy Hatch,** for many years superintendent of the Arthur Mill, has been named director of labor relations for the company. **John Allen** will replace Mr. Quigley as assistant superintendent of the Arthur Plant, and **L. S. Pett** will succeed Mr. Garrity as assistant mine superintendent.

Edward H. Greenwald has been promoted to the position of Mining Engineer for the Boone County Coal Corporation at Sharples, W. Va. He has been with the company since his graduation from the University of Pittsburgh in 1942.

JULIAN W. FEISS

Named Editor, Mining Congress Journal

JULIAN W. FEISS, now on terminal leave from the United States Army is to become the new Editor of the Mining Congress Journal, effective February 11.

Mr. Feiss, originally from Cleveland, Ohio, is a graduate of Princeton University and the University of Arizona School of Mines. Prior to entering military service in 1942, he was on the technical staff of the Climax Molybdenum Company at Climax, Colo. While at Climax he worked on problems embracing mine haulage, dust control, drilling and blasting and diamond drill exploration. Before 1937 Mr. Feiss was associated with Crowell & Murray, Inc., of Cleveland, Ohio. As mining engineer for this firm, he did extensive work on various phases of mine development including iron mining and ore sampling, coal work in the West Virginia fields, gold mining, nitrate mining in Chile and other operations in the metal mining field. Prior to his connection with Crowell & Murray, Inc., he was in the field for Rhodesian Congo Border Concessions, Ltd., in Africa during the late twenties at the period of development of the Rhodesian copper field.

Mr. Feiss comes to the editorship with a wide experience in mining and mineral operations, fitting him excellently to serve the industry through the Mining Congress Journal.

A. M. C. Receptionist Retires

Mrs. Anna Teeple, receptionist for many years for the American Mining Congress, was tendered a luncheon by the staff on January 12, at the Hotel Statler, on the occasion of her retirement. She will be remembered by her many friends in the industry whom she has so pleasantly served on their visits to the Washington office. Mr. and Mrs. Teeple are leaving on an extended motor trip throughout the United States and Mexico. Shown above, seated (left to right), Mrs. Ruth Sullivan, Miss Gladys V. Ludlow, Mrs. Teeple, Miss Alice Murphy, Mrs. B. C. Wilkerson. Standing (left to right), Lt. Col. Harry L. Moffett, Mrs. Julian D. Conover, Miss Kathryn Hathaway, Miss Ruth Huebner, P. D. McMurrer, Mrs. Olive Martinson, Mrs. Marjorie Rector, A. W. Dickinson, Miss Thelma Taylor and Julian D. Conover, secetary. Unable to be present were Mrs. Maude Taylor, Mrs. Peggy Allen, and Glenn B. Southward.

Henry B. Van Sinderen recently resigned as president of Callahan Zinc-Lead Company and was elected chairman of the board of directors. Simultaneously, **Joseph T. Hall** was elected president and director of the company. Mr. Hall was executive vice president and a director of the company at the time of his entry on active duty with the Army in May, 1942. He was recently released from service as a major.

Election of **Graham Granger** as assistant vice president and appointment of **John Mitchell** as director of a newly organized research department has been announced by **Halfdan Lee**, president of Eastern Gas and Fuel Associates. Since 1936 Mr. Granger has been associated with Eastern's Koppers Coal Division as an engineer and later as assistant general sales manager with offices in New York. Mr. Mitchell has been associated since 1928 with subsidiary companies and other organizations affiliated with Eastern Gas and Fuel Associates.

Ray G. Noble has resumed his position as advertising manager for the Union Wire Rope Corporation after

three years service with the U. S. Army. Mr. Noble had been with the Wire Rope Corporation five years before his entrance into armed service.

The following changes in Phelps Dodge Corporation's western branches have been announced by **Harry M. Lavender**, general manager, effective January 1:

C. R. Kuzell, director of labor relations and consulting metalurgist, becomes assistant general manager at Douglas. **G. C. Davis**, manager of Morenci branch, has been transferred to Douglas as director of labor relations. **L. M. Barker**, manager of New Cornelia branch, has been appointed manager of Morenci branch, succeeding Mr. Davis. **Ernest Wittenau**, general superintendent of Morenci operations, becomes manager of New Cornelia branch at Ajo, Ariz. **W. C. Lawson** becomes general superintendent of Morenci branch. Mr. Lawson has been mine superintendent at Morenci since March, 1942. **W. P. Crawford** has been named assistant general superintendent of Copper Queen branch at Bisbee. Mr. Crawford has been mine superintendent at Bisbee. **H. C. Henrie** remains general superintendent at Bisbee, in charge of Copper Queen operations.

Boone County Coal Corporation, through its secretary, **B. Deemer**, announces the following changes effective January 1: **R. W. Wilmoth** has tendered his resignation as vice president in charge of sales, owing to ill health. **H. R. Cleaver** has been appointed as general sales manager.

A. G. Mackenzie, manager of the Utah Metal Mine Operators Association, announced on January 16 the appointment of **James K. Richardson** as assistant manager.

Mr. Richardson has been connected with the mining industry for 15 years. He left the office of secretary of the Tri-State Zinc and Lead Ore Producers' Association to enter the Army, from which he has just been released after three years' service as a captain of anti-aircraft artillery. Prior to his work with the Tri-State Association he was with Climax Molybdenum Company in Colorado for five years as director of industrial hygiene and accident prevention.

Paul F. Deisler, for many years an accounting executive with the American Smelting and Refining Company, both in Latin America and in New York, has opened offices in El Paso, Tex., as a management engineer, offering professional services to industry, mines and smelters in the Southwest and in Mexico.

Frank M. Gray, manager of sales in Utah, Colorado, southern Idaho, eastern Nevada and western Nevada, with headquarters at Salt Lake City, for the Giant Division of Atlas Powder Company, retired January 1.

B. T. Poxson, of Denver, Colo., has resigned as president of the Emperius Mining Company, but will remain as chairman of the board. He is succeeded as president by his son, **Tyrus Poxson**, who had been on the operating staff.

— Obituaries —

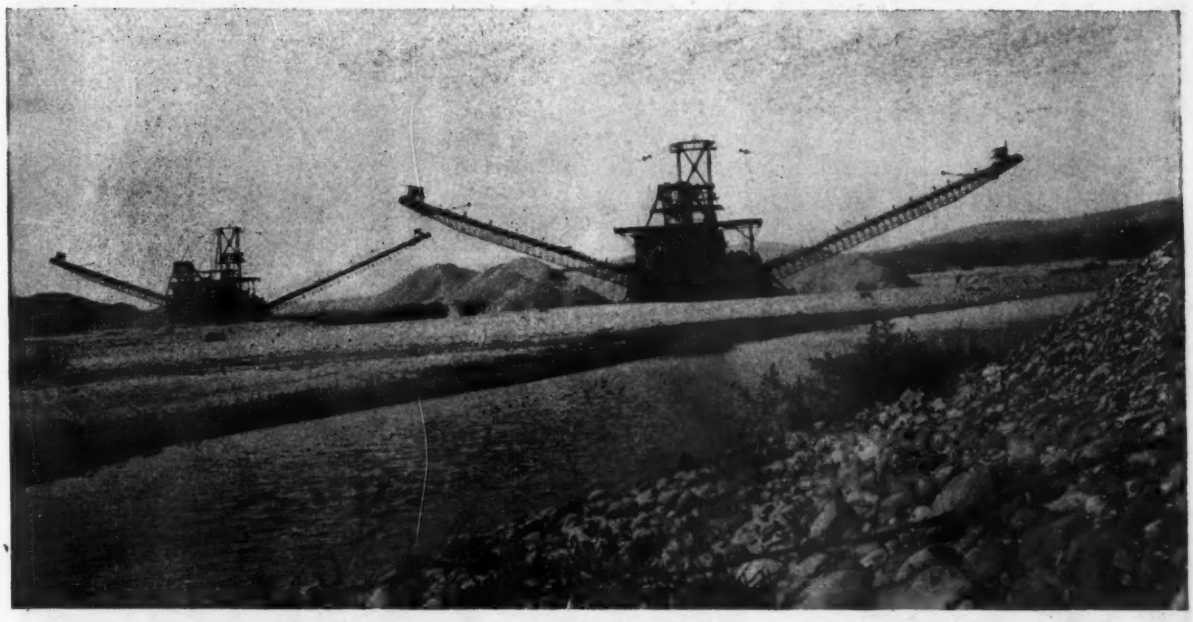
Harvey M. Mansfield, 82, for many years active in Florida's phosphate industry, died in Tampa on December 20. Captain Mansfield was born in Wakefield, Mass., and graduated from Massachusetts Institute of Technology. Burial was in Wakefield.

Edward Hardy Clark, 81, former president of Cerro de Pasco Mining Corporation, died on December 16 at the Fairmont Hotel, in San Francisco.

Carson W. Smith, 64, president and manager of the Consolidated Coal & Coke Company, operating in Wells

Placer Dredge Parts

—By Yuba



Yuba double stacker dredges at Hammonton, California—digging flood control channels for U. S. Army Engineers during gold dredging operations.

Yuba's wartime job, building 155 mm howitzers for the Army, is now history. The full facilities of its engineering staff and plant are available for building placer mining dredges and parts. Yuba dredges are used throughout the world for mining gold, platinum, tin, and other mineral products. Dredges are not a side line with Yuba. If your dredge was built by Yuba or if Yuba furnished parts in the past, a complete record is in our San Francisco engineering files. A letter or cable referring to your old order will bring a quotation for duplicate parts. Quotations will be made promptly after receipt of drawings or specifications.

Look over this partial list of Yuba placer dredge parts; perhaps your operating reserve stock is low. Continuous production, by your dredge, depends upon an adequate supply of spare parts; rush orders, after a breakdown, are costly because of the lost yardage and can be avoided by having spares on hand.

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SAFETY MINDED operators—and they grow more numerous daily—recognize the Whaley "Automat" as the coal industry's safest loader.

The "Automat" is safe because of its natural and effective method of loading with its vertical lift shoveling action loading head. In closely timbered workings and narrow entries especially, this shoveling action, in a vertical plane, is vital to safety because there is no danger of side-kicking of machine . . . no knocking out of timbers . . . no possibility of crushing men.

In tight shots the "Automat" is particularly effective because it moves straight forward under material, lifts as it simultaneously pulls backward for depositing material on jib conveyor. With such action dangerous jerking of machine from side to side is not possible.

This natural shoveling action is an exclusive feature of the Whaley "Automat" and an important reason why you should consider this machine for uninterrupted performance, maximum tonnage and lowest operating cost.

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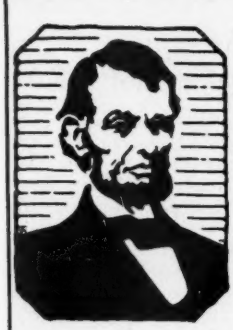
Mechanical Loaders Exclusively for Over 38 Years

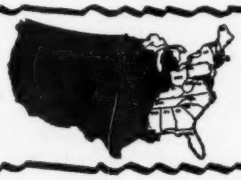


WITH malice toward none; with charity for all; with firmness in the right, as God gives us to see the right, let us strive on to finish the work we are in; to bind up the nation's wounds; to care for him who shall have borne the battle, and for his widow and his orphan—to do all which may achieve and cherish a just and lasting peace among ourselves and with all nations.

—*Lincoln.*

NEWS and VIEWS

Eastern States



Koppers Coal Takes Over Operation of Eccles Mining Properties

L. C. Campbell, vice president, Eastern Gas and Fuel Associates, Koppers Coal Division, announces that, effective February 1, Koppers Coal has taken over the operation of the Eccles mining properties, 10 miles west of Beckley in Raleigh County, on lease from the Crab Orchard Improvement Company.

The Eccles property comprises nearly 9,000 acres of coal land from which about 1,000,000 tons of coal a year are now being mined.

Plans are already underway for the improvement of the community, the mining operations and the surface facilities, details for which will be announced in the near future.

There are two Eccles mines—No. 5 mine, Beckley seam, and No. 6 mine, Sewell seam. They are located on the Virginian and the Chesapeake and Ohio railroads.

—x—

West Virginia Geological Survey Regains Service Personnel

With the return of Dr. Paul H. Price, State Geologist, the West Virginia Geological Survey has almost regained its pre-war personnel strength. During the war years over one-third of the staff was on leave, serving with the armed forces or allied services.

Dr. Price held the rank of Lieutenant Colonel in the Army Specialist Corps as Mineral Resource Specialist. After intensive training in the United States and England on Military Government and Civil Affairs, Col. Price served with the British Military Government in France for six months as special adviser on mineral resources, coal, limestone, and ground waters; and for a year in Germany in the G-4 Division of Supreme Headquarters Allied Expeditionary Forces as Chief of Saar Unit of Solid Fuels Section, supervising maintenance and operation of coal mines. After the Saar reverted to the French, Col. Price was assigned to American Headquarters at Frankfurt with the Production Control Agency on coal and nonmetallics for German industry.

Dr. A. J. W. Headlee, Survey Chemist and Gas Analyst, resumed his duties the first of the year. For nine months he was associated with Johns Hopkins University, Applied Physics Laboratory, Silver Spring, Md.

Dr. E. T. Heck, Geologist, returned in December after two and one-half years as Lieutenant in the U. S. Navy, having served in Newfoundland, Canada, North Africa, and various parts of the British Isles. While shore-based in Africa in the Office of Port Director, Lt. Heck had occasion to study the possibility of commercial production of tin and tungsten deposits in French Morocco. At the recent GSA meeting in Pittsburgh, Pa., Dr. Heck presented a paper on this subject.

John P. Nolting, Geologist, was called to active duty in 1940. As Lieutenant Colonel, Corps of Engineers, he served for three years in

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India as District Engineer in Kurmitola, Base Section Engineer in Karachi, and Assistant Base Section Engineer in Calcutta. His work was supervision of airfield and general construction at Karachi, Bangalore, Calcutta, Kurmitola, Tezgaon, and the vicinity of Sylhet.

Miss Mary Jane Newlon, librarian, joined the American Red Cross in 1943 and was assigned to the Recreation Division in Calcutta, India.

Dr. Price advises that a new and comprehensive program of survey work is under way.

Bluefield Coal Show Scheduled

The Southern Industrial Exhibition, sponsored by the Pocahontas Electrical and Mechanical Institute and the Pocahontas Operators Association, will be held in Bluefield, August 22-24. The forthcoming exhibition will be the first held since 1941. General chairman for the event is Lewis C. Tierney, president, Eastern Coal Sales Co. B. B. Housman, of the Pocahontas Operators Association, is serving as exhibition director.

Island Creek Coal Co. to Develop Mine No. 24

J. D. Francis, president, Island Creek Coal Company, recently announced plans for the development of the property which it leased from United Thacker Coal Company, located on the Rockhouse Fork of Pigeon Creek in Mingo County, West Virginia.

Mine No. 24, on which initial work has already started, is located about two miles south of Lando, and will be served by the Norfolk & Western Railroad. The company has under lease from United Thacker about 6,000 acres at this point. The coal to be first mined is the Cedar Grove seam, varying from 5 to 7 ft. in thickness, with an average of about 6 ft. It is high quality steam, domestic and metallurgical coal, low in ash and sulphur and high in carbon, BTU and fusion. The quality is very similar to that now mined from Island Creek Mine No. 22.

Plans call for a completely mechanized operation from all standpoints. Coal will be mechanically cut, drilled and loaded; the mine will be a slope mine, and coal will be brought to the surface on a 650-ft. belt conveyor. The seam is about 135 ft. under the railroad at the point where it will be developed.

The construction of a modern tipple is under way, with a capacity of 4,000 tons of clean coal a day. It will be equipped with the latest type of screens, washers and drying equipment; loading booms, mixing bins and other modernized devices will make this one of the best preparation plants Island Creek Coal Company has ever built. It is expected that production will start in May and that it will be producing to capacity by October 1.

The operation will require some 400 to 500 men, and a modern mining community is being planned near the mine.

Coal Mining Institute Elects Officers

The Coal Mining Institute of America held its 59th annual meeting in Pittsburgh recently and elected a new slate of officers for 1946. These include: President, G. W. Grove, U. S. Bureau of Mines, Pittsburgh; vice presidents, C. A. McDowell, director of industrial labor relations, Jones and Laughlin Steel Corp.; C. M. Donahue, mining sales division, Mine Safety Appliances Co., and J. L. Hamilton, assistant manager of mines, Republic Steel Corp.; J. A. Younkins, assistant general superintendent, Duquesne Light Co., was made secretary-treasurer.

The meeting featured reports of several subcommittees on means of preventing mine fires resulting from short circuits and leakage of electricity. Other sessions of the event were given over to discussions of underground communications, of sludge recovery to avoid stream pollution, use of a timber truck to cut and

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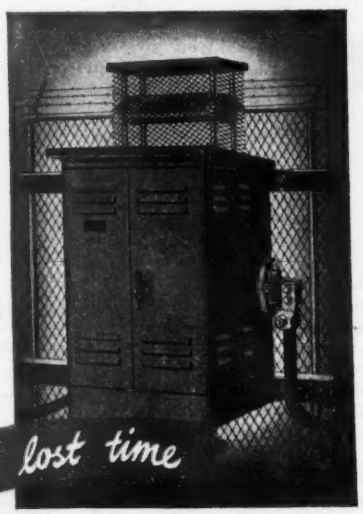

Unattended Sectionalizing Circuit Breakers stand guard twenty-four hours a day to localize electrical disturbances and resume service the moment lines are cleared.
Not only is continuity of service improved, but fire hazards are reduced, maintenance lessened, total energy and power demand lowered.
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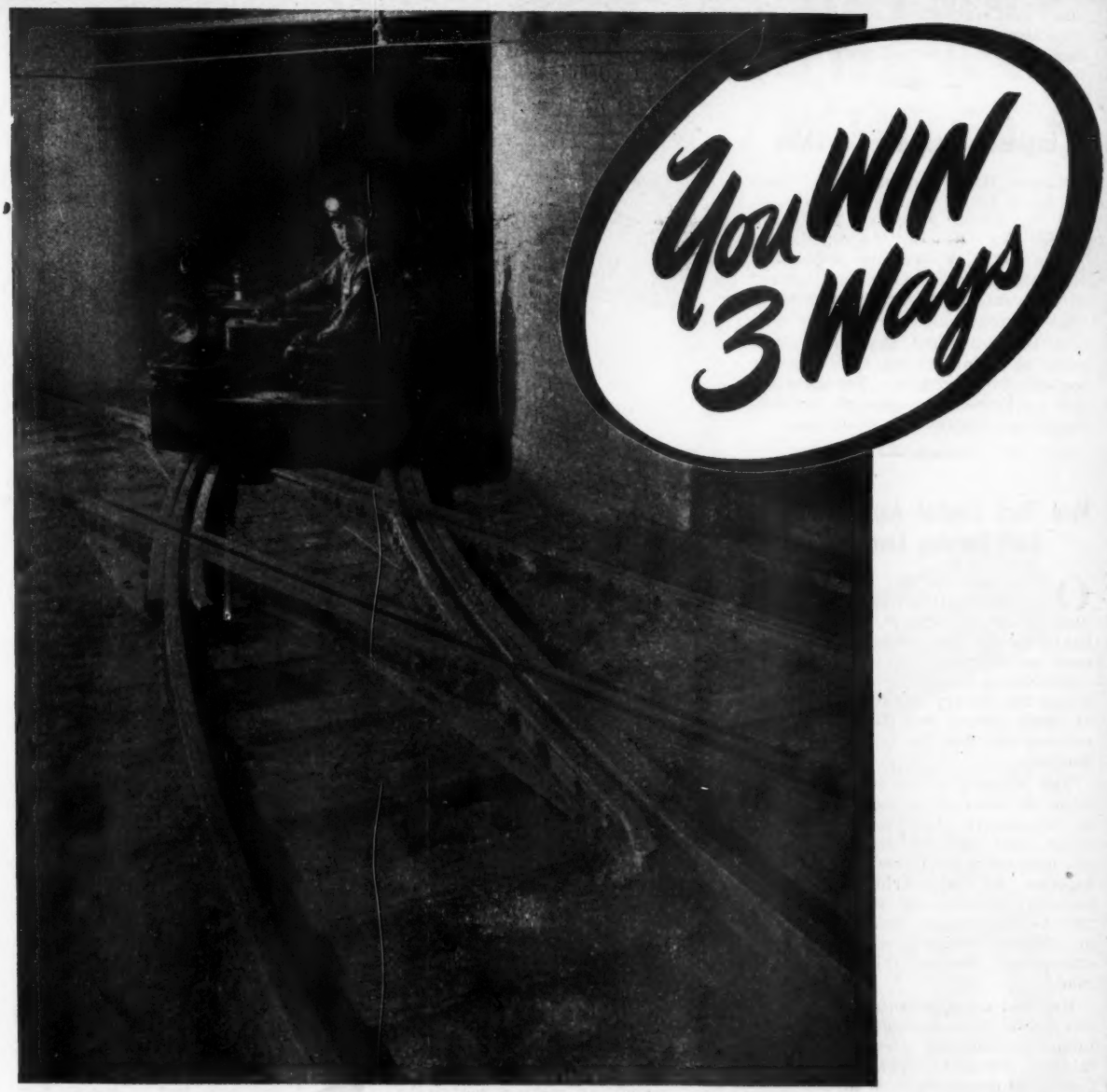
I-T-E AIR SWITCHGEAR
Representatives in Principal Mining Areas



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Time for some housecleaning underground? There (and on the surface, too) Bethlehem Prefabricated Track will save you worry, time, expense. Here are some reasons:

(1) The track is carefully figured to meet your needs after Bethlehem engineers have studied a sketch or blueprint of your mine workings. Every detail is planned in advance.

(2) When the plan has been approved, the rails are cut to length and properly curved in the Bethlehem shops. That's one headache out of your way. The right switches, switch stands, steel ties, crossings, turnouts, guard rails, braces, frogs, joints, and bolts are chosen for the job. The outfit comes to you complete, with nothing else to buy . . . and engineered to your particular layout.

(3) With rails precurved and the cutting to length all done, all you need to do is bolt the track together. You'll have a system that will stand up under today's heavy loads . . . that will give you faster haulage, fewer derailments, higher tonnage per day.

The cost? Low. The results? High—as already proved by many big producers.

BETHLEHEM STEEL

place roof supports at room faces, and organization of mine inspection districts to handle mine disasters.

Engineer Group Goes to China

James H. Pierce of Pierce Management, Inc., Scranton, Pa., is leaving for China February 16 accompanied by Messrs. Koper, Lucien Eaton and J. W. Woomer of his staff to make plans for the development of the coal and mineral resources of that country.

It is anticipated that the initial phase of their work will take approximately five months. Headquarters will be Peiping, in care of National Resources Commission of China.

New York Central Announces New Coal Burning Locomotive

OF interest to the coal industry is a very attractive booklet with photographs and charts, recently published by the New York Central Railroad announcing their new Niagara coal-burning locomotive. This booklet traces the history of the development of their freight and passenger locomotives and has the following introduction:

The Niagara is the culmination of some 40 years of consistent progress in locomotive development, during which New York Central and American locomotive engineers have worked together to help bring the coal-burning reciprocating steam locomotive to its present high efficiency—an efficiency which is nowhere better exemplified than on this great railroad.

Railroad managements look to motive power improvement as a major factor in reducing costs and maintaining favorable operating ratios. Continued development of all forms—steam, electric, diesel-electric, steam turbine and gas turbine locomotives—is therefore vital to the future of rail transportation. The economic and engineering factors which ultimately determine the best choice of motive power for a given use are many and complex, and the modern, coal-burning, reciprocating steam locomotive continues to play a major role.

The new 4-8-4 is the largest and most powerful steam locomotive yet built for operation on the New York Central. It is capable of 4,850 hp. at 65 mph. with 79-inch wheels—a capacity which is adequate for any job of freight or passenger hauling it may be called upon to do. The first delivery was in March, 1945. Twenty-five more will be built.

Pneumatic tires designed primarily for industrial equipment have come into new usage in a special type conveyor belt roadway that is hauling more than 450 tons of coal, rock and shale an hour from the Locust Coal Company mines at Shenandoah, Pa. The 4.00 x 8 six-ply tires, mounted on shafts revolving in bearings, are placed at the dumping point to absorb the shock of falling material. The 36-in. belt, built by the Goodyear Tire and Rubber Co., has been in service more than a year and is said to show little or no wear

Anthracite Institute and Anthracite Industries Consolidate

The activities of Anthracite Institute and the Anthracite Industries, Inc., have been consolidated under one industry organization, Anthracite Institute. Frank W. Earnest, Jr., formerly Executive Director of Anthracite Institute and president of the Anthracite Industries, Inc., was elected president of Anthracite Institute.

The consolidation of the activities of the two organizations is in the interest of greater efficiency and an expanded program for the industry. In the past, Anthracite Institute functioned mainly on matters pertaining to production, statistics and general industry, while the Anthracite Industries, Inc., was responsible for research, dealer and equipment trade contacts, advertising and public relations.

In order to facilitate the administration of its increased activities, Anthracite Institute will establish offices in Wilkes-Barre to take care of all matters pertaining to production, statistics and other general industry affairs. The research laboratory now located at Primos, Pa., will be moved to the Wilkes-Barre area as soon as suitable facilities are available.

The field representatives of the Anthracite Industries, Inc., will continue their activities under the new arrangement. Public relations, advertising and marketing programs will continue under the direction of the present New York office.

Other officers of Anthracite Institute are M. R. Grover, vice president; Dr. R. C. Johnson, vice president in charge research; E. H. Walker, vice president in charge public relations; J. D. Jillson, secretary and assistant treasurer; H. R. Stanton, treasurer and assistant secretary.

Kentucky Mining Institute Meeting

The Kentucky Mining Institute meeting at Lexington recently, elected as its president, George M. Humble, chief engineer, Stearns Coal and Lumber Co. Other officers elected are as follows: First vice president, V. D. Picklesimer, general superintendent, South East Coal Co.; second vice president, S. J. Dickenson, general manager, Mary Helen Coal Corp.; third vice president, O. W. Evans, general superintendent, Norfolk & Western Railway; and secretary-treasurer, A. D. Sisk, safety director, Big Sandy-Elkhorn Coal Operators' Association.

The annual meeting was highlighted by discussions of vocational education in coal mining, safety considerations, altimeter ventilation surveys, fires and explosions in Kentucky coal mines in 1945, and new graphs for washability investigations.

Service Demonstration

A typical example of unjustifiable criticism of coal is illustrated in the following account taken from the Maryland Bureau of Mines monthly notes for December, 1945.

The fireman at the plant complained that "the coal would not heat." Stokers had been installed in the plant about one year ago but the fireman had been instructed, or at any rate he was under the impression that all he should do to keep the stokers going was to keep the hoppers full of coal—that the stokers would do the rest. The Bureau Fireman tried to impress upon the institution fireman that these stokers "cannot think," that they have to be helped along in different ways, especially when they are burning two different kinds of coal, and that the air supply may have to be changed from time to time, and that with some coals the fires will require more attention as to cleaning and removing clinkers. Furthermore, that with some coals the furnace and boilers would require cleaning more often of the soot accumulations.

In one furnace it was found that the stoker had forced coal into the firebox until the fuel bed was higher than the top of the fire-door; in fact, the coal bed was so deep that it was piled up to the roof of the furnace. This furnace had not been cleaned for three or four days, so the institution fireman said.

In another furnace the fire was in a very fair condition as the institution fireman had cleaned it that morning, but when the Bureau Fireman opened the clean-out doors in the top of the boilers, or over the fuel bed, he found soot and ashes had accumulated on the heating surfaces of both boilers to a depth of approximately 2 in. The institution fireman's attention was called to this condition and it was explained to him why he was not getting the heat through the metal to the water in the boiler.

Wanted

By a large producer in Southern West Virginia—

Draftsman-engineer for preparation plants and mine structures, capable of handling design and detail.

Also

Mine map draftsman, including survey calculations.

Address replies: Box 200 in care of this publication.

HOLMES SHEAVE WHEELS

Holmes' Bicycle Type Head Sheaves are a heavy duty, light weight wheel, designed to eliminate undue bearing wear and avoid high inertia which consumes unnecessary power. Renewable steel liners with bolts locked against turning. Rim and liner full machine turned in the groove for true running and saving of rope wear. Hub ends machined for true running against bearings.

PRODUCTION EQUIPMENT

ROBERT HOLMES AND BROS.
BINS - GATES - LOWERING SPIRALS - DUST-O-LATORS - SHAKING GATES
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FOR MODERN MINING

These high quality, cast, all-steel spoke sheave wheels may be had in a wide range of sizes, for either single or double strand operation. They are full machine turned in the groove to give longer rope life. Hub ends perfectly machined to insure perfect alignment of bearings. May be had with or without bearings.

Central States

Lead Workers Present Silver Plaque of Missouri State Seal to Battleship Missouri

At a ceremony at Flat River, Mo., early in January, Governor P. M. Donnelly, on behalf of the mine, mill and smelter workers of the St. Joseph Lead Company, presented a silver plaque of the Great Seal of the State of Missouri to the battleship named for their state. The 30-lb. plaque, cast from silver mined in the St. Joseph Lead Company's southeast Missouri lead mines, was designed by the famous American sculptor, Paul Manship. It was accepted for the battleship *Missouri* by Captain R. H. Hillenkoetter, commanding officer. Presiding at the ceremony was Mr. Clinton H. Crane,

president of the St. Joseph Lead Company who was accompanied by the following company executives: Messrs. I. H. Cornell, vice president; Andrew Fletcher, vice president and treasurer; E. V. Peters, vice president.

About 10,000 Missourians gathered at this lead center to witness the presentation. Among them were Senator Donnell and Representative Carnahan.

The following special messages for the occasion were received from President Truman and Navy Secretary Forrestal:

The White House,
Washington, January 2, 1946.

Dear Mr. Crane:

Nothing would give me greater pleasure than to be with my fellow Missourians when they present a copy of the Great Seal of Missouri to the giant battleship which bears our state's honored name. Although I cannot be with you in person, my thoughts will be in Missouri next Sunday.

It is especially fitting that our state's emblem is fashioned from silver mined, milled and smelted in Missouri by Missourians. To the home folks and to all who participate in the significant ceremony of presentation, I send hearty felicitations and warmest personal greetings.

Very sincerely yours,
(Signed) HARRY TRUMAN.

Great Lakes, Ill.,
January 4, 1946.

Hon. Phil M. Donnelly,
Governor of Missouri,
Jefferson City, Mo.

The Navy Department appreciates the spirit of loyalty and fellowship expressed by the mine, mill and smelter workers of the Lead Belt area of Southeastern Missouri in the gift of a silver replica of the Great Seal of the State of Missouri to the Battleship *U.S.S. Missouri*. During the war many essential products using or derived from lead mined by the people of your state helped keep our ships in fighting trim. Many are still required for peacetime operations. To the officers and men serving aboard the ship I am sure that this symbol of your state will be a constant reminder of that pleasurable feeling of mutual regard.

JAMES FORRESTAL,
Secretary of the Navy.

Stench-Warnings Tested in Lake Superior District

THE effectiveness of stench-warnings as signals of emergency conditions requiring the removal of men from a mine has again been demonstrated in a series of tests recently conducted in underground metal mines of the Lake Superior district, according to Dr. R. R. Sayers, Director of the Bureau of Mines.

At the suggestion of the Bureau, 12 tests were made in ten representative metal mines in the area, and in all but one of the experimental studies, the stench liquid (usually ethyl mercaptan) was introduced into the compressed-air system of the mine. Bureau observers were present during each test and carefully recorded both the procedures employed and the results obtained.

Frank E. Cash and Ernest W. Johnson, authors of the report on these tests, point out that in the majority of cases, injection of the stench liquid into the compressed-air system provided a satisfactory warning. However, to warn workers in isolated areas, they recommend a simultaneous introduction of the stench into the ventilating system.

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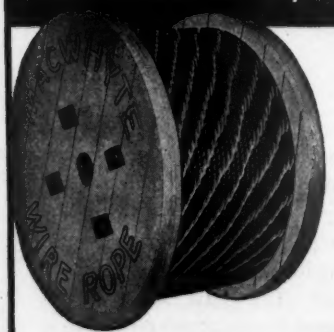

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Individual synopses of the information obtained in each test as well as descriptions of the physical conditions prevailing in the mines included in the study are included in Report of Investigations 3850, "Stench Warning Tests Lake Superior District Mines." Copies may be obtained free from the Bureau of Mines, Department of the Interior, Wash-

Shaft Being Sunk at White Pine

The Copper Range Company is sinking a new shaft at its White Pine holdings in Ontonagon County. The copper occurs in sandstone beds and parting shale underlying the Nonesuch shale. Tests extending over several years have developed mining methods and milling practices for the treatment of the ores.

Scrap Timber Used for Charcoal

A special grade charcoal is being developed by the Cliffs Dow Chemical Company at Marquette. The charcoal is being made from scrap timber not suitable for underground mine use. Rapid growth of the use of controlled-atmosphere carbon-gas generators in heat treating certain steels is furnishing an outlet for this charcoal. The company is also deriving more than 20 other products from low-grade timber.

Marion shovel loading into Walter 20-ton dumper at Webb mine of Snyder Mining Co., in Minnesota

College of Mines to Expand Facilities

In addition to expanding and improving the quality of courses, the Michigan College of Mining and Technology at Houghton has asked for an appropriation to construct a new mining and geology building.

The mining department will have laboratories for ventilation, exploration and mine machinery and research; the geological department laboratories will include those for rock and mineral studies, X-ray, spectographic, polished and thin section, and gem-polishing.

The proposed building will also house the A. E. Seaman Mineralogical Museum.

PARMANCO Horizontal Drills

PARMANCO Horizontal Drills are used exclusively in the Iron Range for horizontal drilling.

They are also used by a large percentage of the strip coal mines.

The new PARMANCO Vertical Drill has revolutionized test drilling.

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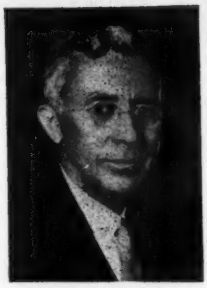
PARIS, ILLINOIS

Sixty Years of Service in Coal Industry

With the announcement that it has passed a total production mark of 150 million tons, the Bell & Zoller Coal Company this month pays special tribute to Herbert E. Bell, chairman of the board, who is currently observing the completion of 60 years' service in the coal industry.

The Bell & Zoller chairman has long been regarded as one of the leading figures in mid-western coal production. He embarked upon his career in the coal industry in 1887 when he entered the wholesale firm of Richards, Pease & Co., Chicago. The Bell & Zoller organization had its beginning in that association of more than a half century ago.

The first venture of Bell & Zoller in direct mine operation came in 1906 when the firm purchased the Centralia Coal Co. in Centralia, Ill., which it still operates. The next Bell & Zoller expansion was in 1910, when the company leased and reopened the Zeigler No. 1 mine in Franklin County. This was followed in 1918, by the development of the Zeigler No. 2 mines. In 1930 the company purchased the properties of the Crescent Coal Co., in Peoria, Ill., but no longer operates them.



H. E. Bell

The Bell & Zoller Coal Company markets its entire production in a single, compact area composed of the states of Illinois, Indiana, Michigan, Missouri, Wisconsin, Nebraska, Iowa, Minnesota and South Dakota.

Changes in executive personnel have been few since the organization of the company in 1896. Mr. Bell retired from the presidency in 1927 and became chairman of the board. H. F. McDonald, who for many years was general sales manager, recently succeeded to the presidency.

Mr. Bell declares that the fulfillment of his 60 years of service to the coal industry is one of the happiest achievements of his life. He looks forward to many years of continued activity and is constantly on the alert for new developments that will further the progress of mining.

Tri-State Zinc and Lead Producers Elect Officers

At the annual meeting of the Tri-State Zinc and Lead Producers Association, O. W. Bilharz, Baxter Springs was renamed president. Also reelected were: H. A. Gray, Joplin, first vice president; G. W. Potter, Joplin, second vice president; and L. G. Johnson, Baxter Springs, treasurer. F. F. Netzeband continues as acting secretary.

The directors include the above named officers and the following: R. L. Dean, Baxter Springs; M. R. Loveman, Joplin; R. H. Beck, S. L. Kenney, and Charles A. Neal, all of Miami; Paul Childress, F. W. Gooch, and D. G. Harrison, all of Joplin; H. H. Hartzell and H. G. Weidman, both of Baxter Springs; and J. J. Inman, Webb City.

No Feed Box or Intake Head Required

In the Denver Vertical Centrifugal Sand Pump* the feed flows downward by gravity into the pump bowl and down onto the runner. The unrestricted vortex action eliminates the need of a feed box or intake head.

Handles Coarse Material Without Plugging Up

The positive downward flow of feed directly onto the runner permits the pumping of difficult-to-handle pulps containing coarse material without plugging up the pump.

Ideal For Pumping Frothy Pulps

Frothy pulps usually present difficult pumping problems because the froth builds up on top of the pulp. The downward flow of feed with the positive suction action eliminates any possibility of air pockets forming in feed pipes.

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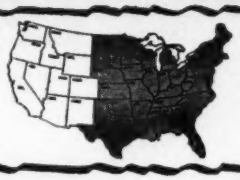

COLORADO MINING CONVENTION

A RECORD-BREAKING, representative crowd from the mining industry attended the forty-ninth annual meeting of the Colorado Mining Association in Denver, January 24-26, and the meeting was generally adjudged the most successful ever held. The business sessions were well attended and the entertainment features reflected the well-known Colorado hospitality. At the final session, Harvey L. Tedrow, of Cripple Creek, was reelected as president. Other officers for 1946 are: B. T. Poxson, of Denver, vice president; C. J. Abrams, of Climax, second vice president; Merrill E. Shoup, of Colorado Springs, third vice president; John Hamm, of Leadville, fourth vice president; J. L. Robison, of Grand Junction, fifth vice president; C. O. Withrow, of Denver, treasurer; and Robert S. Palmer, of Denver, executive secretary.

First day of the meeting was given over principally to a mineral resource conference in which representatives of 15 Western mining states participated. Walter E. Scott, Jr., chairman of the Colorado Mineral Resources Board, presided. Opening the conference, George M. Fowler, consulting geologist, Joplin, Mo., presented an interesting paper on "Extent of our Mineral Reserves" in which he declared that before committing the nation to a policy of foreign purchases "we must first give the mining industry an opportunity to uncover new minerals, not exposed to the surface." The various state representatives reviewed the mineral resources of their states and were joined by a number of well-known mining leaders in the general assertion that our country is not a "have-not" nation, and that our requirements for strategic metals can be met largely by concentrating on more economic production methods for submarginal deposits and by extensive exploration.

Elmer Pehrson, Chief, Economic and Statistics Branch, U. S. Bureau of Mines, discussed "Our Mineral Reserves," pointing out that the nation's known reserves of copper, lead, zinc, and mercury have been heavily depleted and advocating that national defense stockpiles should be made up chiefly from foreign materials in order to buttress our natural resources. On the other hand, Dr. W. E. Wrather, Director, U. S. Geological Survey, spoke at the Thursday luncheon and called for vigorous exploration of the U. S. by his agency seeking the discovery of more adequate mineral reserves. He praised the metal mining industry's war record, and said that "in a land of such wide diversity and size as the United States, we will eventually come to realize that great mineral resources still remain to be developed."

The regular convention sessions opened Friday morning with a forceful statement by Robert S. Palmer, executive secretary of the Colorado Mining Association, on the subject "Can Mining Take It." Palmer reviewed the industry's war-time record, called for more effective protection of domestic producers, and urged the industry to be more active in its own interests. He said that "If mining men are indifferent they are left to the mercy of those who neither understand them nor care for them."

Speaking on "Destiny Dollars" at the Friday luncheon, Orval W. Adams, executive vice president, Utah State National Bank, Salt Lake City, warned of the dangers of printing-press money and called for a balanced national budget on a sound currency base. Congressman Clair Engle, of California, summarized pending gold legislation, called on gold mining to formulate a program of legislative effort, and commended the fine work of the American Mining Congress in connection with present hearings on the gold mine relief bill.

Problems of lead and zinc mining were highlighted in panel discussions led by Otto Herres, vice president, Combined Metals Reduction Company, and Felix Wormser, Lead Industries Association. Together with a number of industry leaders they called for a lessening of the Washington controls and restrictions which prevent normal developments in the industries.

An innovation in the convention program was the presentation of several timely operating papers, including "Modern Mining Methods," "Modern Treatment Methods," "Modern Incentive Plans," and "Experiments on the Flow of Air on Model Drifts and Shafts." Silver problems received a full airing and the convention heard former U. S. Senator D. Worth Clark urge the passage of legislation before Congress "to compel the Treasury to do what we all thought it was obliged to do when we passed the Silver Purchase Act of 1933, namely, to buy all domestically produced silver that is offered at $1.29 an ounce until the total Treasury stores of silver equal one-quarter of the total of the combined Treasury stocks of silver and gold. Other discussions were devoted to fluorspar; oil shale; U. S. monetary policies; magnesium and our future economy; geologic objectives in mineral exploration, and prospecting.

The traditional Gold and Silver banquet, attended by a crowd of more than 1,400, heard Senator Pat McCarran tell of an all-time demand for silver as an industrial metal and money medium, and attack Government controls on silver with the assertion that the Government should not penalize the American miner for producing silver.

The traditional Sowbelly Dinner climaxed the convention. Addressing a record-breaking crowd of some 1,800 men, Senator O'Mahoney spoke on behalf of the President and said that he had pledged to use "the influence of the Federal Government for the development of the mining industry and the utilization of the resources of the West."

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Power Scrapers

PICTURED above is a typical power scraper installation as laid out by Sauerman engineers for storing and reclaiming large daily tonnages of coal, ore, or other bulk materials.

This Sauerman system, operated by one man, is handling a storage pile 35 ft. high covering 105,000 sq. ft. of ground. Moving material to or from any point in the area, scraper handles an average of 100 tons an hour at a cost of about 3c a ton.

For details of other Sauerman scraper layouts for stockpiling, excavating and strip mining, write for our catalog.

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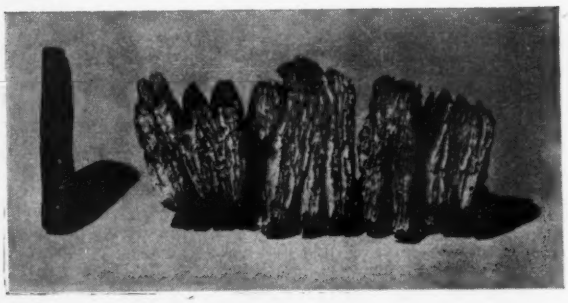
Mt. AleXite Vermiculite Mine Discovered and Shipping

What may prove to be the second largest deposit of vermiculite ore in this country has just been opened and is in shipping operation at Mt. AleXite, near Encampment, Wyo., on a branch of the Union Pacific Railway. Geologists have estimated, according to J. Don Alexander, president, AleXite Engineering Co., that the mountain contains several million tons of vermiculite ore and a lease covering 60 years' operation has been signed.



AleXite before and after being expanded 16 times by heating to 2,000 deg. F.

A long drift has exposed a large tonnage of high grade sericite, which is also being shipped.

Vermiculite ore is heavy and dense and is shipped cleaned and sized from the mine to many operators throughout the country who feed it through a simple expanding or exfoliating furnace, similar to an ore roaster. Low car-load bulk freight-rates have been established from Mt. AleXite siding. The ore expands from nine to 16 times its original size and weighs only from six to 10 lb. per cubic foot after exfoliation. Vermiculite is a micaceous non-metallic, non-organic mineral and contains chemicals and moisture between the layers which cause an accordion-like expansion under heat. Millions of tiny air cells in expanded AleXite account for its insulation value in building and its water-absorption value in agriculture.

The expanded AleXite is sacked and sold for fireproof poultry litter, loose-fill insulation, plaster and concrete aggregate and many other uses.

Kennecott Makes Research Grants

The Kennecott Copper Corporation has announced research grants totaling $250,000 to the University of Utah and the Utah State Agricultural College, to be used for the promotion of mining and agriculture.

A grant of $200,000 was made to the University of Utah for metal mining research and expansion of the school of mines. The Utah State Agricultural College received $50,000 for research in the application of mineral products to agricultural purposes.

The grants were announced by E. T. Stannard, president of Kennecott Copper Corp. through D. D. Moffat, president of the Utah Copper Co. and were accepted by Dr. A. Ray Alpin, president of the University of Utah, and Dr. Franklin S. Harris, president of the Utah State Agricultural College.

Mr. Moffat pointed out that America's unprecedented needs for metal during the war and the inroads made in known ore reserves, makes it advisable that new ore discoveries be sought and fuller utilization of mineral products be attempted to conserve mineral resources.

The grant to the University of Utah carries with it the requests that the university direct research to further improve prospecting by geophysical and allied methods, and that research be conducted to discover more beneficial uses for such metal mine and mill products as are now partly or wholly waste, keeping in mind the greatest possible utilization of metallic resources.

The Utah State Agricultural College grant is accompanied by the request that the college commence experiments to determine whether small amounts of minerals fed directly, or through the medium of plant food, might assist animal development.

Annual Meeting of New Mexico Miners and Prospectors Association

The New Mexico Miners and Prospectors Association will hold its first annual meeting, since the war, April 25, 26, 27, at Albuquerque. Dates for the meeting were set by the Board of Directors. New officers will be elected and an expanded program of activities adopted for the year 1946. President of the State Association is Horace Moses, general manager of Chino Mines Division, Kennecott Copper Corporation, operating at Santa Rita and Hurley.

Horace Moses Honored for Selective Service Work

Signal honor was accorded Horace Moses, general manager of Chino Mines Division, Kennecott Copper Corporation, by Gov. John J. Dempsey, when Mr. Moses was designated to represent the Selective Service Boards of New Mexico's 31 counties in Washington on January 21, at which time President Truman presented to chosen Selective Service Board members from each of the 48 states an award for meritorious service. Throughout the war, Mr. Moses served as a member of the Grant County Selective Service Board.

New Mexico Mine Report

The annual report of the State Inspector of Mines for New Mexico, Warren Bracewell, covering the year ending October 31, 1945, showed the total value of production of all mines for the year as $41,935,755, compared with $48,824,297 in 1944, a decrease of $6,888,542.

Production values were as follows, for the years 1945 and 1944, respectively: Copper, $17,116,956—$13,454,179; potash, $13,620,367—$13,940,753; zinc, $9,193,478—$6,451,011; coal, $5,709,027—$5,200,901; lead, $633,916—$903,053; silver, $256,373—$242,162; gold, $125,512—$149,646; and other minerals, and non-metallics, including molybdenum, manganese, fluorspar, pumice, iron and talc, $2,138,668—$1,593,850.

Grant County maintained its unbroken record as the major mineral producer in New Mexico, with a total of $21,653,209. Colfax County led in the production of coal, $3,762,968. During the year, 2,603 men were employed in metal mines in Grant County and 784 men in coal mines in Colfax County.

Over-all employment figures in New Mexico mines for the year were: Mineral mines, 4,659, a decrease of only 10 compared to 1944; coal mines, 1,334, a decrease of 418 compared to 1944. There were eight fatal accidents in metal mines and six fatal accidents in coal mines. Two fires occurred during the year in coal mines.

The State Mine Inspector pointed out that during the entire war period every effort was made to produce minerals for use in the manufacture of war materials, and this allowed no time for development work. Hence with so little development work done

in the past three or four years, the time has come when developing must begin in order to keep the mines operating.

Montana Mineral Resources Inventoried

Although Montana's mineral resources are valued in the billions by Dr. Francis A. Thomson, director of Montana Bureau of Mines and Geology, a preliminary inventory of the state's minerals does not paint a glowing picture of booms based on recent startling discoveries of new mineral deposits, but instead on the gradual, business-like development of one of Montana's great assets. This inventory sticks to the facts. It was prepared by the Bureau in response to a request from Governor Sam Ford and is probably the first specific inventory of Montana minerals.

"Most of the easily found and readily worked bonanzas have been discovered already. Nevertheless the future mineral production of Montana will undoubtedly exceed in value the three and one-half billion dollars worth of mineral produced to date, but the winning of it will require careful engineering analysis in its inception and thoroughly trained technical skill in its execution," Dr. Thomson pointed out.

In all 68 minerals are mentioned with gold, silver, lead, iron, zinc, copper, coal and petroleum products being given greater prominence. Montana's known mineable coal is believed to be 400 billion tons, which if valued at only one cent a ton adds four billion dollars to the state's potential wealth.

Among the minerals which are gradually coming to the fore commercially in Montana, in addition to those already noted, are agate, antimony, arsenic, asbestos, travertine and other building stones, cadmium, calcite, brick clay, corundum, graphite, gypsum, lime, manganese, natural gas, phosphate rock, talc, tungsten, vanadium and vermiculite.

New Cornelia Mine Converting to Electricity

Electrical installation will replace steam, oil-burning locomotives in the Phelps Dodge New Cornelia mine at Ajo, the cost of a two-year project to convert to electricity set at $2,000,000, according to announcement by Harry M. Lavender, Douglas, general manager of the corporation.

The new installations will include trolley poles, grade and track realignments, the purchase of 13 locomotives, 11 electric and diesel auxiliaries, and two straight diesels. Two diesel auxiliary engines will be placed in each electric locomotive to prevent interruption of work in the event of power failure; and the diesels will be utilized in regions of the pit that electric locomotives cannot reach, Lavender said. Initial operation of the electric equipment will be made in January, 1947, but the project will not be complete until late in the year.

The New Cornelia mine has used steam locomotives since the pit was opened in 1917.

Mine Accidents Drop

Arizona serious mine accidents dropped off by 224 in 1945; and fatal accidents in Arizona mining totalled nine, one less than in 1944, according to recent report of the state mine inspector, Clifford J. Murdock.

New Arizona Mining Activities

Notes gathered on mining activities in Yavapai, Yuma, and Mohave counties of Arizona report new operation of the Ryan Brothers' mill at Chloride in the treatment of company and custom ores; new operation of an

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The Modern Way!

The causes for blown-out shots—improper stemming or too much powder—are known by all experienced shot-firers. To avoid the loss of time, extra cost and safety hazard of blown-out shots, hundreds of mining companies are using tamping bags— SEALTITE BAGS Bags encourage good stemming and give a better seal—giving better shot control and bringing down more coal—even with less powder. It will pay you to make a test to learn all of the advantages of using bags for tamping. We will send all the samples you need—FREE. Write us today just giving the bore-hole size you use.

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electric smelter at Parker by H. Terry for ores at Bouse; development at the Amity mine in the Castle Creek district through surface pits and diamond drilling; and disposal of the French Lilly mine, a gold-zinc property, by John Nezck. The Amity company has purchased the Copperolis group of claims from J. W. Ketron, Prescott, it is reported.

Getchell Mine Sinks Shaft

A three-compartment shaft being sunk by the Getchell Mine, Inc., at its Potosi district property in Humboldt county, is two-thirds completed, according to latest report. It is planned to sink 1,000 ft., to the level of that depth, with levels at 600, 800 and 900 ft. Getchell mine is probably the largest gold mine in the state, and paid several million in dividends before it had to stop and place its mill at work on tungsten ores. The company has a huge mill which is being operated on three-shift schedule. There is still a dearth of good miners, company officials report.

Manpower Shortages Slow Up Gold Mining Resumption

While mining men are readying to resume work in gold properties in Nevada, a scarcity of good miners, it appears, is going to slow up resumption. However, the Copper Canyon mine in Lander county, reports a net gain of 23 men during December. Production for the month was 5,590 dry tons of gold-copper ore, with approximately an average of 250 tons milled daily on a two-shift mill basis. The mill capacity is 325 tons daily at the mill, and it is the hope of the management to increase milling to at least 300 tons daily by the end of January and on a three-shift basis.

Old Discovery May Lead to Atomic Energy

Prof. Jay A. Carpenter, director of the Nevada State Bureau of Mines and head of the Mackay School of Mines at the University of Nevada, in a recent news story tells of the discovery 15 years ago of ores in the Round Mountain district which is now declared to be torbenite, a copper uranium phosphate. It was of little or no value at the time but the atomic energy discoveries, it is declared, may now make it of considerable importance.

Test Work in Jessup District

There is much interest in Pershing county regarding test work being undertaken in the Jessup district in nearby northern Churchill county. Some 2,000 ft. of trenching is being conducted at the Friendly Tip-Lucky Strike mine, and of the few analyses made the reports appear favorable. There is a great tonnage of eroded material and reports show $2 values at surface to $14 at 300 ft., where diamond drilling has taken place.

Independence Mine Reopened

Reopening of the Independence mine in the Tuscarora mining district in Elko county is under way by a group of Idaho mining men, who plan to install a flotation plant. The property consists of a group of silver-lead-gold claims, where considerable development work has been done and some values found.

Sunshine Mining Company to Develop Big Creek Apex Property

The board of directors of the Big Creek Apex Mining company announces that a deal with the Sunshine Mining company has been confirmed by the stockholders whereby Sunshine will develop and operate the Big Creek Apex property on a 50-50 basis. The property is located south of and adjoining the Sunshine Consolidated and west of the Sunshine. Sunshine proposes to reach it with a 300-ft. crosscut from the 3,700-ft. level, or 1,000 ft. below sea level. It will be the first time in the history of the district where a mining property has been primarily prospected at so great a depth. Big Creek Apex is an Idaho corporation capitalized at 2,000,000 shares and the Sunshine Consolidated owns 1,400,000 shares of the stock.

Silver Dollar Development

The Silver Dollar Mining company's shaft is now down past the 2,300-ft. level, with the objective at 2,800 ft. The work is progressing at the rate of 110 to 125 ft. per month. The mineral development in view in this shaft work is the easterly extension of the so-called Chester vein system, in which the Sunshine, Polaris, Silver Dollar and Silver Syndicate have located rich ore bodies further west. The Polaris Mining company is also sinking an independent shaft east of the Silver Dollar to a depth of 3,000 ft. with the same end in view. Silver Dollar will develop the vein in its own ground and the adjoining Silver Chieftain Mining company claim, and the Polaris will develop the vein in the original Chester Mining company's claim, in which it holds controlling interest, and in the adjoining Yakima-Shoshone Mining company's Nellie claim, in which Polaris holds a 50 per cent interest.

Lucky Friday Shipping Ore to Golconda

The Lucky Friday Silver-Lead Mining company is now shipping 2,000 tons of high-grade milling ore to the Golconda custom mill. A similar shipment of the same grade of ore recently netted the company over $30,000. Lucky Friday is now sinking its main shaft from the 1,000 to the 1,400-ft. level and has made a deal with the Hunter Creek Mining company, owning adjoining ground northeast, and the Lucky Friday Extension, owning adjoining ground south and west, whereby both of these properties will be extensively developed after the Lucky Friday has completed drifting the full length of its own property.

Prospecting Resumed After Wartime Interruptions

The Atlas Mining company has resumed prospect mining operations on a large group of claims southeast of Mullan, Idaho, after a suspension caused by war conditions. Just prior to the war, Hecla Mining company sunk a four-compartment shaft on the Atlas to a depth of 800 ft. and drifted 1,000 ft. on the vein on the 800 level, exposing very favorable lead-silver ore deposits, but abandoned the project because of excessive costs, high taxes and short labor supply. The Atlas company now proposes to reverse the operation and develop the ground to the west of the main deep tunnel opening.

Geological Survey to Study Section of Coeur d'Alene District

The U. S. Geological Survey plans a study of a section of the Coeur d'Alene mining district that has been dormant since the early discovery of the district. The section of the district referred to lies south and east of Wallace and is about 12 miles in length and of undetermined width. It is the eastern extension of the now famous silver belt which has produced the bulk of the silver mined in the United States since 1933, and is the scene of recent rich discoveries at depths of 3,700 feet, or 1,000 feet below sea level.

MANUFACTURERS FORUM

Shinguards for Shuttle Car Tires

Shinguards for mine shuttle car tires which take a heavy beating far underground is the latest conservation development of the Goodyear Tire & Rubber Company, Akron, Ohio. These tire shields are circular protectors of ⅜-inch steel which may

be applied easily and quickly, extending far enough up on the tire to protect the sidewall area where cutting and snagging might otherwise occur.

Use of these shields, according to W. A. Kemmel, manager of Goodyear truck tire sales, has solved the answer to many tire failure problems, in coal mines, where shuttle cars must move over sharp edges of fallen slate and rock and again projecting pillars of coal. No change in tire pressure is required.

The shields clear the tire safely, giving plenty of room for normal flexing without chafing of the sidewall. Shields on shuttle cars are designed for Goodyear L-type rims, with which most cars of this type are equipped. They fit in place in approximately the same position taken by the rim side flange, and are held in place by lock rings, which are furnished with the shields.

New Process of Internal Plating Makes Steel Pipe Corrosion-Resistant

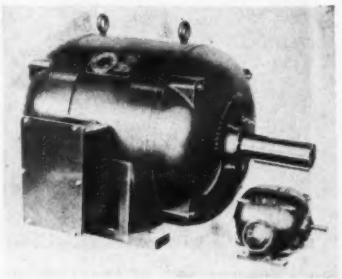
The inside of steel pipe can be electro-plated with nickel or other metals by means of the "Bart lectro-clad process." It develops a smooth, ductile, pore-free nickel deposit fully adherent to the base metal, according to reports, and can be applied to pipe or tubing up to 18 in. overall diameter, in random lengths approximately 20 ft. Use of the process endows steel pipe with the corrosion-resistance of nickel, while retaining the low cost, strength, and fabricating characteristics of the former.

Fittings and pipe line accessories are available for complete piping systems. Welding and fabricating techniques have been fully developed. The internally plated pipe can be welded, reduced and bent, hot or cold, without destroying any portion of the internal lining.

For information concerning any specific problem, write the Bart Manufacturing Co., 227 Main Street, Belleville, N. J.

Extends Line of Protected-Type Motors

With the addition of three new frame sizes, designated as B58-A, B, and C, the Crocker-Wheeler division of Joshua Hendy Iron Works, Ampere, N. J., now offers a complete line of alternating-current, squirrel-cage protected type motors from 1 to 200 hp. Priced the same as the conventional open type and rated 40 C rise, full-load continuous duty, with a 15 per cent service factor, these motors are said to provide full protection against dripping liquids, falling metal chips and other foreign matter.

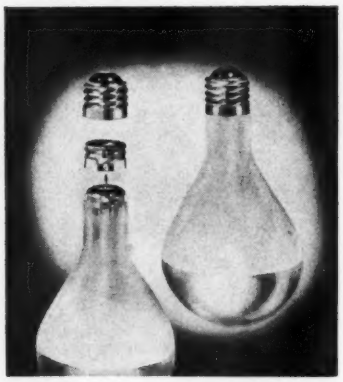


Sizes built in NEMA standardized frames, 203 to 326, inclusive, have no openings in the frame or shields above the horizontal center line. NEMA standardized frames 326 to 505 as well as the three, newly added, larger sizes are basically the same in construction with the addition of two shielded, air exhaust openings in the upper half of the frame. The design of these openings precludes any possibility of falling liquids, etc., entering the motor.

"Minit Maintenance," a recent development in equipment lubrication announced by Balcrank, Inc., of Cincinnati, Ohio, consists of a lubricating container and applicator, said to operate on an entirely new principle; lubricates all types and sizes of machines, regardless of varied kinds of fittings—on the job or in the shop

Lamps Now Permanently Locked

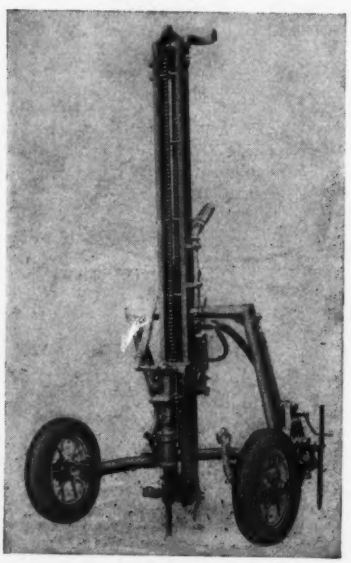
Superlok, a construction said to permanently lock bulb to base, and heretofore supplied primarily to the U. S. Government, is now standard on all large Wabash-Birdseye lamps manufactured for civilian use. The new construction is claimed to eliminate base cementing and neck strapping,



and consists of a threaded collar screwed into and notch-locked to the base, with its collar claws gripping the dimpled neck of the glass bulb. The result is said to be a permanent lock that cannot be separated by the weight of the bulb, position of burning, heat or age. All standard-line Wabash-Birdseye lamps from 300 watts and upward, all reflector lamps and industrial infra-red heat lamps will be manufactured with this base. Wabash Appliance Corporation, 345 Carroll Street, Brooklyn 31, N. Y.

Wagon Drill

Worthington Pump and Machinery Corporation is putting into production a newly designed Blue Brute wagon



drill. The company's construction equipment division claims that its new model, the UMW-40, incorporates several radical design features which have produced better than usual test performances.

The UMW-40 uses a heavy duty drifter, the cylinder of which has a diameter of 4 in. It has rifle bar rotation and Worthington positive acting end-seating valve with circumferential seal. The cylinder controlled blowing device gives exceptional hole cleaning ability. Added features are: one piece chuck sleeve, positive drill steel locking chuck for 1¼-in. hollow round lug shank drill steel, one air hose to backhead with swivel to prevent fouling. Heat treated alloy steel is used in all major parts, and slow rotation parts are available. The drifter may be easily converted to wet drilling. Strong rotation, low air consumption and exceptional drilling speed are said to give low cost per foot of hole drilling.

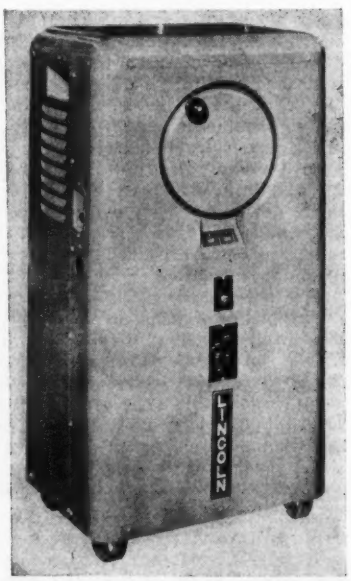
—Compressed Air Institute.

Boiler tubes are quickly cleaned with this device consisting of a shovel handle attached to pipe, at the end of which is a metal disc for dislodging soot in the tubes. Compressed air is introduced into pipe from metal hose at left of worker and air valve is controlled by chain in worker's hand. After soot is dislodged, air is released to blow it out

Low-Priced Welder

A new low-priced welder which is ideal for rural power lines and is said to overcome all the objectionable features of previous welders designed for this type of service has just been announced by the Lincoln Electric Company, Cleveland, Ohio.

The new unit, called the "Fleet-Arc Jr.," is for 230 volt, single phase power lines and meets the limited input requirements of rural Utilities and REA by a design of high efficiency and high power factor. It has a maximum input current of 35 amp. and provides a machine which meets the new NEMA standards for this type of welder. It can be used with the standard 3-kva power transformer provided by the power company. Current range is from 20 amps. at 20 volts to 180 amps. at 25 volts welding



duty. This gives sufficient capacity for all types of jobs found on most farms or job welding shops. It will handle electrodes ranging from 1/16-in. to 5/32-in. diameter.

"Fleet-Arc Jr." weighs 360 lbs. and is, therefore, readily portable.

Full information can be obtained by addressing the Lincoln Electric Company at Cleveland, Ohio.

Sullivan FF-211 Slusher

Sullivan Machinery Company, Michigan City, Ind., announces a new line of short-length slushers in the 7½ and 10 hp. sizes. They are called the "FF Series" and supplied in two and three-drum models. Gearing is considerably stronger than in any previous Sullivan slushers in this class, but the units have a shorter overall length and occupy less space.

An outstanding feature is the modern design which allows the owner to use any one of a large variety of driving units. A special short-length alternating current electric motor, standard A.C. or D.C. motors, the Sullivan Pistonair engine or the famous Sullivan Turbinair motor can be supplied.

A recurring problem in the mining industry is the necessity of using air-driven equipment at times when electric power is not available in certain areas. Later, as wires are strung and switches installed, the more efficient electric motors become desirable on slushers. With a type FF slusher the problem is simplified because the air motor can be replaced with an electric drive in a few minutes at the working place.

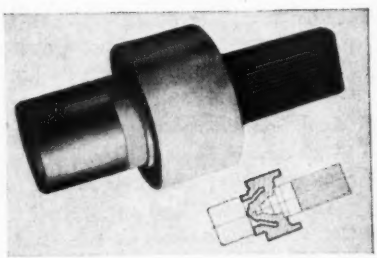
For the first time, on units of this size, Sullivan supplies the automatic, anti-backlash, weight-actuated, band-type, no-spin snubbing brakes.

Flange type motors, cast steel base, direct lubrication to shielded type bearings and sealed gear cases are all regular features and have been used for years on the larger heavy-duty Sullivan line of A, B and C slushers.

New Molding from MELMAC

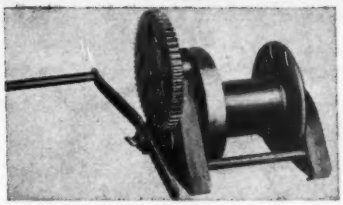
The plastic collar on this brush stud holder for heavy-duty 90, 250 and 500-volt D.C. motors is an unusual molding made from American Cyanamid Company's rag-filled Melmac.

The cross section drawing shows



the details of the insulating section which joins the two metal parts and at the same time provides superior insulation.

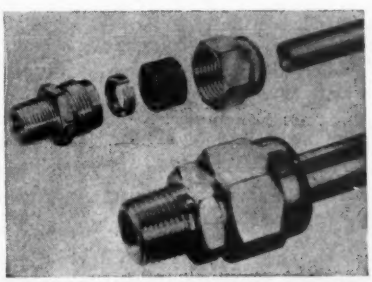
Melmac provides the required arc resistance and di-electric strength. These properties are combined with the characteristic of resisting nitrate deposit when exposed to the action of an electric arc in the presence of moisture over an extended period of time. The high flexural and impact strength of this plastic greatly reduces breakage of parts due to shock and vibration and makes possible the joining of two heavy metal inserts.



American Hoist & Derrick Co.'s new "Handiwick" soon to appear on the market

Flexigrip Tubing Fitting Eliminates End Preparation

Flexigrip time-saving tubing fittings said to eliminate end preparation or soldering of the tubing and yet produce a stronger, leakproof and flexible joint have been announced by



Gustin - Bacon Manufacturing Company of Kansas City, Mo. The Flexigrip fitting, made in standard sizes from ⅛-in. to 1½-in. O.D., consists of four parts—the body, a gripping ring, synthetic rubber gasket and nut. To attach the fitting, the nut (with gasket and ring inside) is slipped over any plain-end tube, cut to desired length. The tubing end is inserted into the body as far as it will go and the nut tightened. Tightening the nut compresses the ring into a tight grip and molds the gasket around the ring for a leak-proof seal that is so flexible it will withstand unusual vibration or impulse.

Eliminating flaring, swedging, or soldering, the tube end adds considerably to the strength of the joint as well as saving time and labor. Economies in time and material are also considerable over the collar, ring or ferrule type of tube-end fitting.

— *Announcements* —

The **Ohio Brass Company**, Mansfield, Ohio, has opened a branch office at 1317 New York Avenue, Washington 5, D. C. E. W. Leahey will be in charge of this new office.

Mr. Leahey, recently discharged as

a Lt. Col. after four years in the Army, had been connected with the Philadelphia office since 1937. The territory served from the Washington office will include Maryland, District of Columbia, Virginia and part of West Virginia.

* * *

Chas. H. J. Patterson, Director in Charge of Engineering of **The McNally Pittsburg Mfg. Corp.**, left by air recently on an extensive trip to London and the Continent, in the interest of coal preparation equipment and processes of his company.

* * *

Plans are being formulated for the **Macwhyte Company** to celebrate its 50th birthday as a corporation in the near future according to announcements which were made recently.

The company from which the present Macwhyte Company has developed was incorporated on February 10, 1896, making this year its golden jubilee. The plans which are underway provide for several occasions to observe this anniversary. More definite announcement regarding these plans is to be made later.

* * *

A series of nine educational bulletins have been compiled by the **Union Wire Rope Corporation** to provide a reference index for the many industrial users of wire rope.

The first instalment has been published and is now available free of charge upon request. Those requesting Bulletin No. 1 will automatically receive the additional issues at frequent intervals at no cost.

The educational series is comprehensive in illustrating the most efficient care and handling of wire rope to not only increase the service life of the rope but of the machinery that it is used with.

Requests should be addressed to the Union Wire Rope Corporation, 21st and Manchester, Kansas City 3, Mo.

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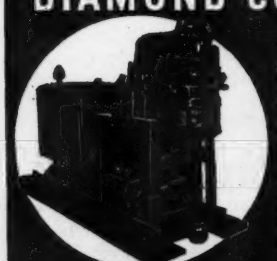

TESTING COAL AND ALL MINERAL PROPERTIES - USING OUR LIGHT GASOLINE DRILLS.. THEY SAVE FUEL AND MOVING COSTS.. WE GUARANTEE SATISFACTORY AND PROPER CORES..

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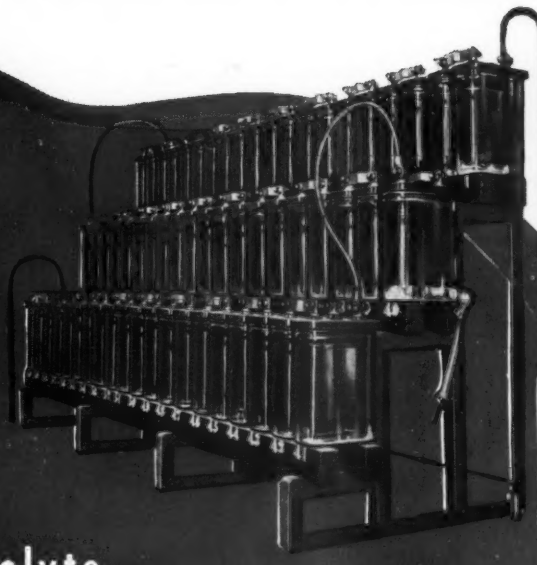
PROBLEM:

To find insulated cable for battery-charging leads—immune to attack by electrolyte



SOLVED WITH FLAMENOL CABLE

An Ohio steel mill required insulated cable for its battery-charging equipment, which consisted of a 250-kw generator and a 27-panel switchboard. Cable was needed for leads from panels to batteries. As the leads ran underground, the cable insulation had to withstand moisture as well as electrolyte fumes and accidental contact with the electrolyte itself. Four years ago, at G.E.'s suggestion, Flamenol* Style FL insulated cable was selected for the job. The mill reports that the original installation is still giving trouble-free service.

RESISTS CHEMICALS— Flamenol Style FL cable is highly resistant to oils, water, mild acids, and alkalies—and weather. It is tough and stable, is flexible at low temperatures, and has high dielectric strength. Flamenol does not support combustion—therefore, prevents outages due to fires. Requiring no protective braid, it reduces the volume of wiring and eliminates terminating problems due to fraying. Its insulation strips easily and leaves the conductor surface untarnished.

A G-E "FIRST"— Only G.E. makes Flamenol cable. Flamenol is the original cable insulated with plasticized polyvinyl chloride. G.E. introduced it in 1935—not as a substitute for rubber-insulated cable but as a new type possessing desirable properties not obtainable in rubber. To find out how Flamenol can help solve *your* problem—save you time, trouble, and expense—ask our local office, or write Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

*Trade-mark reg. U.S. Pat. Off.

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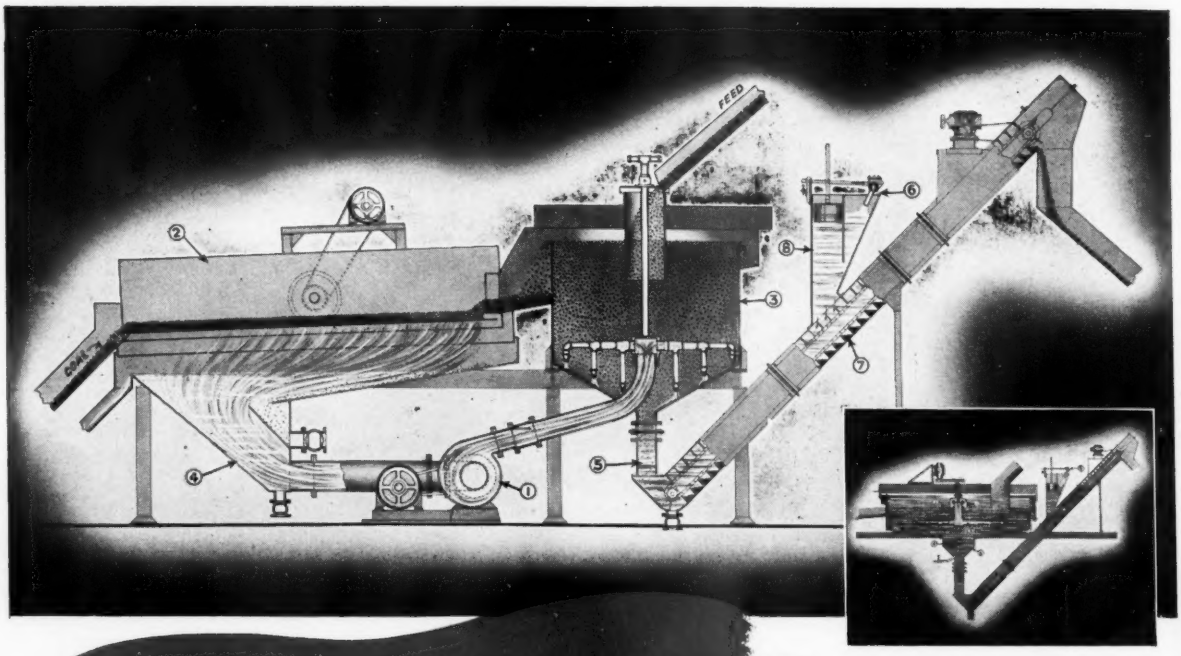

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Raw coal is passed through a circulating fluid medium in which the gravity of the fluid is automatically built up and maintained so that the coal floats away from the refuse and is delivered over a dewatering screen.

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Coarse coal can be prepared economically with the popular R & S Hydro-Separators, another R & S engineering achievement used in many profitable installations. Ask for Bulletin No. 161.

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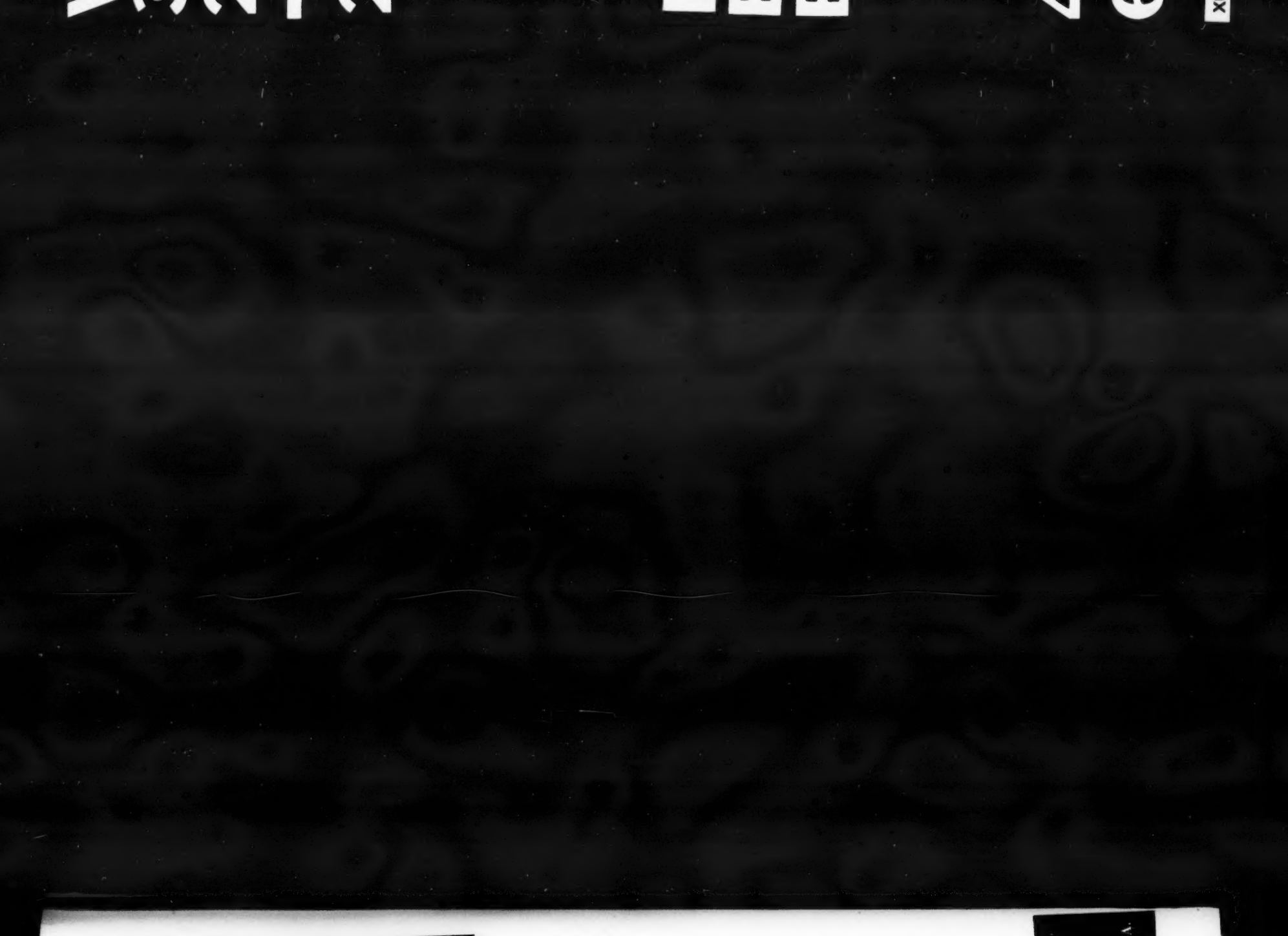
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